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Electro-Therapeutical Section.

October 18, 1912.

Dr. REGINALD MORTON, President of the Section, in the Chair.

PRESIDENTIAL ADDRESS.

Arthritis.

IN reviewing the past work of this Section and its parent—the British Electro-therapeutic Society—it is noticeable how few papers have had any reference to the subject of arthritis. There would seem to be a danger of neglecting these less "dramatic" diseases in our study of the application of radiology to internal medicine and surgery. The excellent work done in these branches is worthy of all praise, and will go on developing and advancing for a long time to come, but the study of arthritis is not an unprofitable occupation for us. It presents itself in many phases and varieties, in the diagnosis of which the X-rays can be of great help, and our methods of treatment of much value in giving relief and occasionally a cure of the affection.

Arthritis in its many forms, though not possessing a high mortality, is one of the most distressing crippling conditions, and one that is widely distributed. It is found in all classes of society, but more in the less favoured ones—that is, those who are least able to afford it. It is thus a disease of great public importance, and it is for all these reasons that I venture to bring it forward on this occasion, and I hope in this way to stimulate a little more active interest in a subject that deserves it. To anyone devoting special study to the subject of arthritis, probably one of the first problems that will confront him will

have to do with those two conditions known as rheumatoid arthritis and osteo-arthritis. If we consult various text-books we find most commonly that these two terms are used very indiscriminately and most often as synonyms of one and the same condition, or as different phases of the same disease. As we dip more deeply into the literature of the subject, especially into the most recent writings, we at once find ourselves in a field of active controversy where the arguments put forward by the different schools are so varied, and each so convincing in their own way, that it is difficult not to side with one or the other with a genuine enthusiasm.

The view likely to be adopted by any one of us will in all probability depend very much on previous training and inclinations. While nearly everyone will agree that rheumatoid arthritis is primarily due to a toxæmia, the neurologist will take the view that the effect on the joints is secondary to the influence of the toxin on the nervous system, and he would have very sound and substantial reasons for this attitude. The bacteriologist, on the other hand, would probably conclude that the effects on the joints were due to the direct action of the micro-organism or its toxin, the nervous symptoms being merely incidental though produced by the same agency. The pure clinician, if such now exists, would ignore these points and look upon osteo-arthritis as a chronic, or perhaps hypertrophic form of rheumatoid arthritis, and all of them mere phases of "rheumatism." Or again, we find an eminent pathologist in the person of Goldthwait, of Boston, making a classification as follows :—

(1) *Infectious Arthritis.*—This term " is used to designate a joint disease resulting from the presence within the body of some infectious organism, the symptoms being due either to the presence of the organism itself within the joint, or to some toxin produced by that organism in some other part of the body." This group is, of course, a very wide one, and includes the more acute cases of rheumatoid arthritis as well as all those of Still's disease. He points out that in the early stages of the cases that come within this group there is active leucocytosis with a high percentage of hæmoglobin. Later on these conditions disappear and secondary anæmia develops.

(2) *Atrophic Arthritis.*—In this group he includes those cases that have a gradual onset and run a chronic course without any pyrexia. In the early stages we have the spindle joint, to be followed later by an atrophy of the whole of the peri-articular tissues as well as the synovial membrane, articular cartilage, and the ends of the bones. This class

includes practically all those cases that are usually described as rheumatoid arthritis.

(3) *Hypertrophic Arthritis.*—This group is characterized by hypertrophy of the cartilages and ends of the bones making up the affected joint, and is identical with what is usually called osteo-arthritis.

Such a classification as this has much to commend it, and coming from an authority of such high standing it is deserving of our serious consideration ; but to many of us, I venture to say, it will not be altogether satisfying. For one thing, the first group is rather too comprehensive, in that it includes all forms of arthritis due to the action of perhaps many different kinds of micro-organisms ; and further, it places the more acute cases of rheumatoid arthritis into this first group, while the less acute and more common variety is placed in the second group. I think it will be found that most observers are unwilling to consider these two conditions, which we term the acute and subacute varieties of rheumatoid arthritis, as if they were separate and distinct diseases.

One noteworthy feature of this classification, to be found also in that of Nathan, of New York, is that rheumatoid arthritis and osteo-arthritis are clearly differentiated from each other, both clinically and pathologically. Other classifications have been made by Pribram, Hoffa, and possibly some others, but in all these mentioned we find this tendency to treat osteo-arthritis quite separately from any other form. Garrod, in the second edition of Allbutt's " System of Medicine," frankly divides arthritis into two main classes, rheumatoid arthritis and osteo-arthritis, and the same arrangement is adopted by Llewellyn Jones, from whose writings I have derived both pleasure and profit, and to whose valuable work I wish to pay the highest tribute.

This classification into two main divisions of arthritis, which might be called the English classification, has not only the virtue of simplicity, but seems to be an eminently suitable one in the present state of our knowledge of the ætiology of arthritis. It would, of course, be very satisfactory if we could classify our cases according to the particular organism responsible for the mischief, and also separate a true rheumatoid from other forms of infectious arthritis ; but as soon as we attempt to do this we find ourselves in difficulties through lack of accurate knowledge. While recognizing that different micro-organisms play their part in the forms of arthritis, the fact remains that so far all efforts to establish the constant association of one particular organism with a particular form of arthritis have met with only partial

success.   The different forms of arthritis glide into one another almost imperceptibly, and it is probably on this account there have been so many difficulties in nomenclature, leading to an apparent confusion between the writings of various authors.   It is to the bacteriologist to whom we now look to lead us out of this Egyptian darkness, and it is not too much to hope that ere long our expectations will be realized. Though, as we have seen, the bacteriological evidence so far available is incomplete in places, there is enough at our disposal to justify the very general belief that these diseases are primarily due to the presence of micro-organisms.   After all, it is difficult to see how the changes observed in the diseased structures can be due to any but the action of a chemical substance which has a disintegrating action on articular and peri-articular tissues.   That these changes are not due to inflammatory reaction is clearly shown by microscopical examination, and if we accept the theory that they are the result of the action of a chemical substance or toxin, it is a fair assumption that micro-organisms are responsible for their production.   These ideas are more applicable to the rheumatoid variety than to osteo-arthritis ; the latter condition is most frequently seen in subjects that are well nourished and not favourable to any form of bacterial invasion ; but in spite of this, and looking at the matter in a broad way, I am disposed to believe the ultimate cause of osteo-arthritis will be proved to be of a bacterial origin.

Before leaving this part of the subject it should be noted that the bacilli described by Schuller as " short plump rods showing polar granulation " as the ones most frequently found in rheumatoid arthritis, are seldom found in the fluid within the affected joint, but much more commonly embedded in the fringes and tissues round about.   This is of importance when we come to consider the question of treatment. There is another point that gives rise to differences of opinion. Do the bacteria invade the joint and produce the toxin in situ, or is the latter produced at some distant point and carried to the susceptible joints by the circulation ?   Here again we find authorities divided into opposite camps.   If the bacillus as described by Schuller is the one responsible for rheumatoid arthritis, it would appear that the local production of the toxin was the correct view ; but on this point we are not yet on certain ground, and as there is considerable evidence pointing to the production of the toxin at a distance, we cannot regard this as settled.

Let us now go into the question of the identity or otherwise of

the two conditions, rheumatoid arthritis and osteo-arthritis, from other points of view; and while here, as in most other instances, it is impossible to lay down any hard and fast rules, I think it will be agreed that we have ample grounds for considering them as quite distinct diseases, having few points of similarity, and in many ways divergent. Indeed, we may go so far as to say that in typical cases the only points of resemblance are that they both attack joints and both cause deformity; and even here the deformities are of quite a different nature—atrophic in one, hypertrophic in the other. If we take a general view of rheumatoid arthritis we see that we have all the conditions necessary to make up a constitutional disease, with important local manifestations. It frequently runs a course that is quite typical of a toxæmia in which the nervous system takes part. At times the onset may be acute with fever and sweating : also vasomotor disturbances such as coldness of the fingers and local congestion. We may also find anæsthesia and loss of power. These symptoms are seen most frequently in young female adults whose constitutions have been enfeebled by influenza, puerperal troubles, pyorrhœa alveolaris, or other bacterial invasions of the digestive system and respiratory passages. Mental worry and anxiety are factors in the predisposition to the disease. Locally, we find that the small joints, notably those of the hands, are the favourite objects of attack, and in the fingers these take the spindle form of swelling that is so characteristic. These swellings, at first covered with a glossy skin, in time tend to diminish in size by atrophy. Nothing corresponding to Heberden's nodes are ever found in this disease.

In contradistinction to this picture let us examine the various points that go to make up the disease we term osteo-arthritis. Here we find it is the large joints that are most frequently attacked, and the subjects are for the most part well-nourished males of middle or advanced age. The onset is never acute, there is no pyrexia, no sweating, no vasomotor disturbances, no loss of power, or muscular wasting. The glossy skin is not seen over the swellings, which are of irregular form and tend to increase with time, becoming more irregular and more deformed. Heberden's nodes are a frequent accompaniment of the condition. In short, osteo-arthritis is really a joint disease with no constitutional symptoms of any importance.

Further differences are to be made out by means of radiography, notwithstanding the fact that most writers tend to discount the value of this method in the differential diagnosis. While it is admittedly difficult at times, especially in the early stages, to make a definite and

accurate diagnosis by the X-rays alone, this is becoming easier with improvements in apparatus and technique, and in nearly every case it can give much valuable direct evidence not attainable in any other way. If, as has been claimed by some authorities, radiography cannot· effect any saving of time in making a diagnosis over ordinary clinical methods—a claim with which I do not entirely agree—it can at least afford corroborative evidence at a very early stage, and it can demonstrate differences between the conditions known as rheumatoid arthritis and osteo-arthritis to such an extent as to make it difficult for anyone to believe they can be merely phases of one and the same pathological condition.

In the course of my investigations into this interesting question I was fortunate enough to come across a case of more or less general osteo-arthritis involving the small joints of the hands among other parts. I am thus in a position to show these two conditions affecting the same anatomical part, and this makes it much more easy to appreciate the essential differences between the two diseases. Fig. 1 is from the hand of a young female adult who had been under observation for about a year, suffering from rheumatoid arthritis. One of the first points to be detected by this method is the irregular narrowing of the spaces between the affected joints, which even in a comparatively recent case may have gone so far as to give the appearance of the articular ends being in actual contact. Here it is very clearly seen in the metacarpophalangeal and the first row of interphalangeal joints—the latter showing the outline of the spindle-shaped swelling, due to peri-articular thickening that is so characteristic of this disease. Erosion of the articular ends of the bones is well shown in some of the joints, notably the first interphalangeal joint of the forefinger and the distal ends of the fourth and fifth metacarpal bones. In addition to this we find, more or less constantly, signs of absorption of the cancellous tissue near the articular ends of the long bones, and in spongy bones such as the carpus. This is well shown at the carpus and adjacent ends of the metacarpus in another plate which I show you. Of course it is well known that a temporary suspension of function will bring about a certain amount of thinning of the trabeculæ, and while this is undoubtedly a factor here, I am convinced that in rheumatoid arthritis we get a degree of this not attainable by rest alone in the same time and in a healthy joint.

Speaking generally, the disease seems to have a preference for the site of an epiphysis, and in the case of those long bones having

but one, such as the metacarpals, it is most active at this end. Similarly as regards the formation of osteophytes: these are rare in rheumatoid arthritis, but when present they are found close to the ends

Fig. 1.

of the bones. The next plate is from the hand of a middle-aged man who has suffered from rheumatoid arthritis, for many years, in a chronic form. The absence of articulate cartilage is well seen, and osteophytes are at the extreme ends of long bones. Apart from this very occasional

production of new bone on a very elementary scale it is quite evident
that in rheumatoid arthritis we have a disease that is essentially
destructive to joint tissues, and one that shows only the slightest
tendency to attempt any sort of repair; and this is found only in
mild cases that run a very chronic course.

FIG. 2.

Fig. 2 is from the hand of a patient with osteo-arthritis of many
years' standing. Here we see that while the joint spaces are narrowed,
they are only partially so, and the spacing between the articular ends
is more or less even. There is no erosion of the ends of the bones

and there are no signs of absorption of the cancellous tissue. Of course, we know there are serious cartilaginous changes in osteo-arthritis, but they are in the nature of fibrillation and partial disintegration, and not carried away by absorption as in the rheumatoid form. The formation of osteophytes is an important feature of osteo-arthritis, and they are found not only at the articular borders but also along the shaft. To show these differences still more clearly I have prepared two slides by contact from the original negatives of figs. 1 and 2, showing the first interphalangeal joint of the first and second fingers. Fig. 3 is the rheumatoid case, and fig. 4 osteo-arthritis. From the
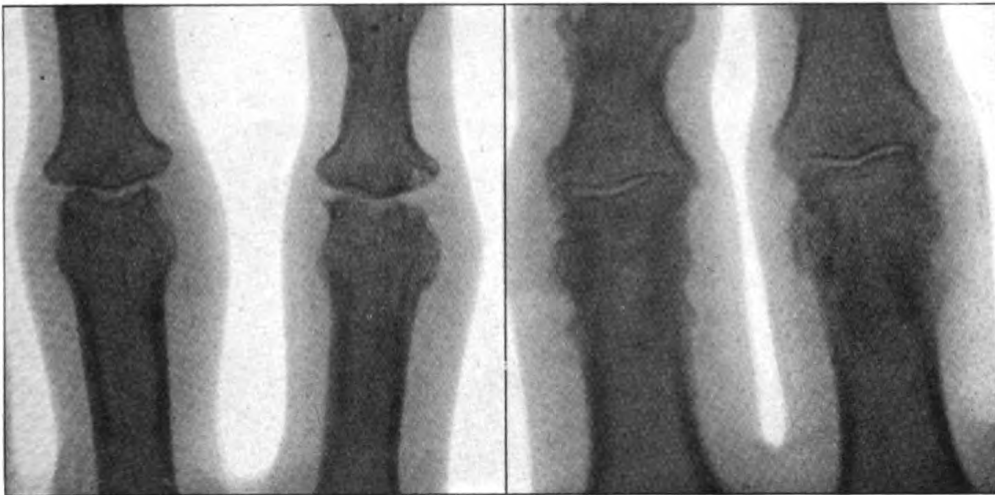

FIG. 3.   FIG. 4.

examination of these plates it is reasonable to express the opinion that while both these diseases are destructive in character, we see more effort at repair in osteo-arthritis than in the rheumatoid form, and as evidence of this we have the active osteophytic process which tends to support the joint, notably in the case of the hip, the increased density of the bones, and the eburnation that takes place on the articular surfaces as the cartilage gets worn away. The destructive character of rheumatoid arthritis is also seen in the shoulder, where we have the high position of the head of the humerus due to the absorption of the articular cartilages and the subacromial bursa; thinning of the trabeculæ of the upper end of the humerus is also evident. I look upon the shoulder as being very susceptible to this form of infection,

especially after injury. In figs. 5 and 6 are shown these diseases as they affect the knee, and on comparing these, which are taken from quite ordinary cases, it is difficult to understand how they could have been classed as different phases of the same disease. Fig. 6 shows the " lipping " at the edges of the articular surfaces that is so characteristic of osteo-arthritis. As the cartilage gets fibrillated and softened it is pushed out from between the bones and undergoes ossification. This is never seen in the rheumatoid form. I now show a plate from an old
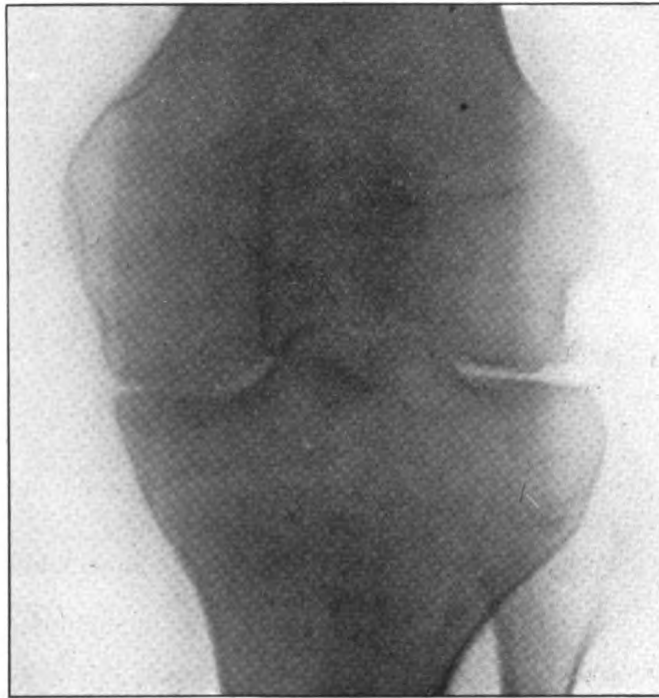

Fig. 5.

case of rheumatoid arthritis where the ligaments had suffered severely, and with the aid of pressure from the boot severe deformities have been produced. The other foot had suffered in the same way.

It is hardly necessary to pursue this part of the subject any further just now. Enough has been said to show what an interesting controversy is going on regarding the nature of the different forms of arthritis, particularly the two forms I have specially mentioned. I also hope I have succeeded in showing how much can be done by radiography in elucidating many doubtful points, even to the extent

of making the distinction between two varieties formerly grouped as phases of the same condition so clear as to be quite unmistakable.

It now remains for us to show whether radiography can anticipate a clinical diagnosis, or at least corroborate it as soon as made. Up to the present most authorities have accorded to radiography a very secondary place as a diagnostic agent in arthritis, and this may have been deserved. I feel sure, however, that at the present time we are in a very much stronger position than ever before; we have better

FIG. 6.

appliances, more skill, and more experience. So far as I can gather, cases of arthritis are submitted to X-ray examination more than they used to be. This is a significant feature as well as an evidence of an increasing confidence in the method. The changes in the early stages of some forms of arthritis may be unobservable by radiography, and when present may be so slight as to be easily missed, but errors are rare if care is taken and a comparison made with the sound side or a corresponding normal part. One source of confusion is the very similar appearances in gouty rheumatoid and arthritis. So far as the bone changes are concerned, in a paper by Koehler, of Wiesbaden, in

the February number of the *Archives of the Röntgen Ray*, the diagrams
illustrating the changes in gout might easily pass for rheumatoid
arthritis.   But being aware of the similarity, and having regard to the
history of the case, we are not likely to be led into any grievous
error.   In any form of arthritis it is important in the highest degree
that an accurate diagnosis should be made at the earliest possible
moment.   This can only be assured if every method of removing
uncertainty has been employed, and for this radiography is entitled
to a recognized place.   In support of this I may mention the following
case.   A boy, aged 14, was sent to me by Dr. Wingrave, suffering
from pain in the right wrist.   It was most noticeable when attempting
to use the wrist for any sudden or twisting movement, and he was

Left.   Fig. 7.   Right.

unable to play cricket or tennis on this account.   It appears that
some months previously he put out his hand to open a swing door,
and at the same moment it was pushed against him by someone coming
through from the other side.   A sharp pain was felt at the time, which
gradually subsided but never entirely disappeared.   Massage, iodine and
so on were used without any definite improvement, and in consequence
of this an X-ray examination was advised.   The two wrists are shown
together in fig. 7.   The two skiagrams were made at the same time
and as nearly as possible under the same conditions.   It will be
observed that the right carpal bones do not come out so clearly as the
left, and there is a distinct narrowing of some of the joint spaces
around the os magnum, particularly on the side next the unciform bone.
These changes are not unlike those seen in rheumatoid arthritis, and

if that was the correct diagnosis, the persistence of the symptoms is explained. It is generally admitted that all of us harbour tubercle bacilli at some time or other, but they cause no inconvenience until something happens to provide a nidus, such as an adherent pleura for instance. The same may be said of many other forms of bacteria, including those responsible for these varieties of arthritis. It is not unreasonable to suppose that here the injury to these carpal joints, though not very severe from the point of view as a casualty, was sufficient to provide the nidus necessary for the micro-organism to obtain a footing. However this may be, the case was dealt with on this basis, and I am glad to say there has been a very satisfactory improvement.

The lesson to be learnt from this case is an important one for all of us. The clinical signs were so indefinite that no clear diagnosis could be made. The first positive opinion that could be expressed was founded on the X-ray appearances, and improvement set in very quickly after the commencement of a line of treatment suggested by those appearances. Unfortunately we do not often see many cases at this early stage, and herein lies the difficulty of establishing our point, that all cases. of doubtful joint mischief should be examined radiographically early, and at intervals if necessary, until the nature of the trouble is made clear. When this is done consistently there will be no doubt as to the value of radiography in the early recognition of arthritis, even to the extent of discriminating between the different varieties.

The subject of the treatment of arthritis generally, and especially of the rheumatoid form, is too vast to include in this address, but there are .one or two points to which I would like to refer before I close. Believing as I do in the bacterial nature of most forms of arthritis, any treatment to be successful must have regard to this, and any site of bacterial invasion must be sought for and dealt with accordingly. I believe that vaccines are of value and that they will be more valuable as this branch of therapeutics is developed. I know that the system has its detractors, and no doubt mistakes have been made, but we all know that sneering at the early errors of any new form of diagnosis or treatment is a very economical form of self-indulgence.

Of the methods practised by ourselves, the one I have the most faith in is ionization, and a solution of iodide of lithium the most useful, though the salicin ion is probably equally good. I do not believe in ionization through solution as in a Schnee bath, since the

current appears to enter almost entirely at the surface of the liquid. Pads made of a dozen or more thicknesses of lint soaked in a 2 per cent. solution are the best, and each joint, or group of small joints such as the carpus or fingers, should be treated individually, one pole on each side, and alternated at each sitting. Lithium iodide is a very deliquescent salt and difficult to keep dry after the bottle is once opened. I now get it in hermetically sealed tubes containing 100 gr. One of these dissolved in 10 oz. of hot water gives a solution of approximately 2 per cent. strength. Large currents are preferable to small ones, but what I consider to be most important of all is that the application should be long—not less than an hour at each sitting—and that they should be given frequently — daily if practicable. I consider this necessary because the ions do not penetrate the tissues very rapidly, and many of them are washed away by the circulation. Though it has been difficult to carry out these ideas in many cases, where I have been able to do so the results have been distinctly better.

If the bacillus of Schuller is the one responsible for rheumatoid arthritis as is probably the case, from the fact of its being buried in the tissues, it is not enough to get a few ions through the skin ; we must endeavour to suffuse the joint with ions, and thus render the site unsuitable to the development of the organism, as well as to stimulate the tissues to increased activity and resistance. The use of high frequency currents, as ordinarily understood, is to all intents and purposes, futile. I am hoping that diathermy may yet prove of some benefit here, but so far as we can judge at present, it looks as if surgery would benefit by diathermy more than medicine.

DISCUSSION.

Dr. IRONSIDE BRUCE said he was glad that the President had chosen arthritis as the subject of his address. The pathology of the associated diseases—osteo-arthritis, gout, and true rheumatoid arthritis—seemed at the present time to be rather confused, and the corresponding appearance of these diseases on X-ray examination not at all definite. Dr. Strangeways, dealing with this subject, went into the differential diagnosis of these conditions by X-ray examination, and concluded that it was a very difficult matter to distinguish one from the other. One point was mentioned by the President— namely, the obliteration of the joint spaces—but he (the speaker) had found that he had difficulty in deciding whether flexion of the joint had not to do with this appearance rather than destruction of the cartilages.

Dr. G. B. BATTEN desired to thank the President for his historical review, as he was himself one of the original members of the British Electro-Therapeutic Society. He was very pleased to hear Dr. Morton's contribution on the subject of arthritis, especially as relatives of his had suffered from various forms of rheumatic affections, and had been treated by vaccines and ionization with good results. With regard to the differentiation between rheumatoid arthritis and osteo-arthritis, he remembered the case of a lady who, he did not doubt after seeing the photographs, had rheumatoid arthritis. Medical men who had seen it clinically differed in their views from one another. For two years the lady was so crippled with the condition that she had to be carried up and down stairs. Her fingers and toes were drawn up, and she did not go six weeks without having either an inflamed bunion or tonsillitis. Recognizing that it was toxæmia, he had her teeth taken out, after Mr. Goadby had prepared a vaccine from them. That vaccine was used in September, 1910, and continued regularly for eighteen months at increasing intervals. The following July she walked 10 miles, and she had increased 2 st. in weight. She had had no illness since. The skiagrams were the same kind as those shown, with absorption of cartilages and thinning of bone. Skiagrams of her hands a year afterwards showed only a slightly increased density of bone. There was no other change in the bones, though her hands now were quite supple.

The PRESIDENT (Dr. Reginald Morton), in reply, said that with regard to the differentiation of the varieties of arthritis, he fully recognized that there were cases in which no dogmatic statement could be made ; there were cases in which there was a mixed infection, and one form might be merged gradually into another. The cases which he had depicted that evening were ordinary cases, the only exception being the deformed toes, which were included as curiosities. In the case of osteo-arthritis of the hands, which had existed for some years, the patient could write and do various things notwithstanding, and could also put the hands down flat. The skiagrams were not made with the hands in a position of flexion. When making a contribution he liked to

take up a strong position : it encouraged attack and helped the ultimate arrival at the truth.   In reference to Dr. Batten's remarks, he had come across cases of long standing where a diagnosis was made by X-rays, whereas, clinically, one could not say whether it was one variety or another.   He was not clear about the early stages of the disease, but when it was well marked it was easy to establish the academical point that osteo-arthritis was distinct and separate from rheumatoid arthritis.   He was glad to hear Dr. Batten speak of the success of vaccine treatment, in which he had great faith.   One should abstain from condemning the method if it failed in some cases ; much had yet to be learned in regard to it, but he felt sure it was a valuable treatment.

Electro-Therapeutical Section.

November 15, 1912.

Dr. REGINALD MORTON, President of the Section, in the Chair.

Electrical Accidents from the Clinical and Forensic Standpoint.

By Dr. S. JELLINEK (Vienna).

THE accidental contact with a wire carrying an electric current may be followed by serious consequences. The principal condition which determines the danger is, of course, the voltage, but this is by no means the only factor. In some cases a wire at 20,000 volts or more has been touched without any disturbance beyond some local injury, whilst in other cases contact with a wire at only 100 volts, or even less, has been followed by instant death. The fact is, that the degree of injury depends on a number of contributing circumstances. These we may call the *conditions of accident*.

These conditions of accident fall under two heads—the *external* conditions of the electrical installation, and the special or individual conditions which are peculiar to the victim. Under the former we may include voltage, amperage, and the phases and character of the current; while under the latter we include the electrical resistance of the victim's body, his physical and psychical condition, and the path of the current. In pathological experiments we have also to take into account the species of the animal under examination. Each of these factors plays a rôle of more or less importance, which can only be determined by an analysis of the mechanism of the accident, and with due consideration of the disturbance of function.

The most important factor is the voltage. If the electrical tension is below a certain minimal value, the danger may be regarded as *nil*. What is the exact minimum is still a matter of dispute. The point at which the voltage begins to be dangerous is usually fixed at 300 volts for an alternating current, and 500 volts for a constant current. Our experience shows that the danger-point should be fixed very much lower.

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We have ourselves seen several fatal cases with an electrical tension of only 110 volts; and a fatal accident is recorded from touching a wire carrying only 65 volts. This was the case of a workman who was removing the crust from a steam-boiler, and who came into contact with an electric lamp. It is therefore a safe rule to regard every electrical installation as a possible source of danger.

With regard to voltage, it is interesting to note that there is an upper as well as a lower limit of danger—the lower one a minimum of a few volts, and the upper a maximum of many thousand volts, as in the high-frequency currents from a Tesla transformer.

The next factor of importance is that of amperage. Here also there is no danger unless the intensity of the current is above a certain minimum. This minimum is also a matter of dispute. It is the general opinion of electricians that a man can bear $\frac{1}{10}$ ampere without fatal results. This, too, is contrary to our experience. We have seen a number of fatal accidents with an amperage much less than $\frac{1}{10}$ ampere. On the other hand, cases are recorded in which a man has taken 1 ampere or more without serious consequences. The result, in reality, depends on the combination of these two factors—voltage and amperage—and on the physical and psychical conditions of the victim.

An accident is usually caused by the victim touching one pole of the circuit, since most electrical installations are earthed, and the circuit is completed through the victim's body if his feet or other parts are in good contact with earth. With a low voltage, however, an accident can only occur if both poles are in contact with the victim.

With regard to the different varieties of current, it would seem that the continuous current is more dangerous than the alternating. The longer duration of action of the continuous current apparently produces more serious effects than the intermittent action of an alternating current of the same voltage and intensity.

Among the individual factors, the most important is the varying resistance of the human body. The skin is the great protection against the entrance of electricity into the body. The resistance of a dry and healthy skin is so great that, in comparison, the electrical resistance of the internal organs is quite negligible. From actual measurement, we find that the resistance of the integument in different individuals varies between 30,000 and 100,000 ohms, and may even be as high as 1,000,000 ohms for the dry, hard skin of a labourer's hands. The more delicate the skin, and the more freely it is supplied with capillaries and sweat-glands, the less is the resistance. On this account the skin of the

female is usually of lower resistance than that of the male. The natural protection given by the skin is reinforced by that of the clothing, more especially that of boots and stockings. This protection varies greatly according to the nature and condition of the clothing, whether they are wet or dry.

Since most accidents are caused by the earthing of a high-tension wire through the victim's body, the state of the ground on which he is standing is a most important factor.

Among floors which are *absolutely dangerous* I would mention those of bath-rooms, cellars, and mines, since they are usually made of conducting material, and are often wet. The danger of electrical installations in such places is therefore greatly increased. Floors which are *comparatively safe* are those which are covered with a carpet, or otherwise well protected. These, however, may be rendered dangerous by the presence of waterpipes, gaspipes, or other good conductors, leading to earth. Sometimes an old gasolier is adapted for the electric light, and if this has not been properly insulated, danger may arise from touching the electric lamp socket with one hand and the gasolier with the other. Several fatal accidents have occurred in Vienna from touching the ordinary electric lamps when the victim has also been in contact with a metallic conductor leading to earth.

I will show you pictures of how such accidents are produced. Here is a picture showing a man touching an old gasolier; the current passed from his right hand through his body to the left hand, and so from the gasolier to the earth. The boy shown in the next picture wished to try what would happen if he touched the electric wire; he was instantly killed. The next picture shows a boy carrying bread through the garden to the house; he touched with his left hand the iron railing, which carried electricity. The day before a mechanic was working on the roof, and when leaving threw away a piece of wire, which remained connected and carried electricity to the trellis work. This was the cause of the boy being killed. The next shows another kind of fatal accident which we have had in Vienna. The man was employed to take out from a cellar an electric arc lamp. The lamp did not light, but in spite of that he was killed. It was a one-pole switch, and the lamp was in continuation with the other wire, so that when the man touched the electric lamp the current from this one pole passed through his body to the earth, and he was instantly killed. The next slide shows an accident which often happens—namely, the breaking of a telephone wire in the street. These, of course, have electric tension, and unless people are careful they may easily be struck and wounded or

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even killed. It is difficult to free such a person, because the telephone wires are very hard, elastic and tough. In Zürich some rescuers tried to set free a man so caught, and in doing so the wire got round the man's neck, with the result that his neck was cut through—burned through by the enormous heat generated. On the screen I show you some small pliers which I have constructed for the purpose of freeing such wires. They are handy and can be carried in the pocket. The ordinary implements are enormously long.

The condition of the earth plays a very important rôle. All these accidents which I have shown you were produced by earth circuit. Another factor which plays a very important rôle is the particular path which the current takes in the victim's body. Many rescuers have been killed from touching such a victim. When the body is struck the electricity passes along two paths—one on the surface and one penetrating the body. In the Physiological Institute of Professor von Tschermak in Vienna we have made experiments on horses, which are very suitable because their bodies are long and the horse is susceptible to electricity. If we subject a horse to 100 volts, we can prove that part of the current goes through the body itself and part through the skin. I think this will enable us to account in some measure for the failure in some cases of electrocution in America. I shall mention this again later.

The mental condition is a most important factor. If you touch an electric wire intentionally, you can bear 100-volt, 200-volt, or even 300-volt currents. At the beginning of my studies I myself touched a 500-volt current, and I know an engineer in Vienna who has touched a 1,000-volt current, a voltage which may easily be fatal. There have been cases in which electricians have been used to receiving charges of electricity and have often intentionally touched conductors, but on doing so once *accidentally*, have been killed. Most of the victims we have observed in Vienna have been persons of experience, some of ten or fifteen years' experience, and yet they have been killed.

A similar phenomenon is observed in electrocution as practised in America. The prisoner is fully prepared for the passage of the current, and therefore the moment of surprise or shock which produces paralysis is absent. Of thirty-six criminals electrocuted in America, in no single instance was there instantaneous loss of consciousness followed by immediate death as so often happens in electrical works. This lack of success in the American judicial electrocution is, in my opinion, due in great part to the absence of this factor of surprise; the failure is also due in part to faulty technique, which causes the path of the electrical current to be partly deflected. When the human body is introduced

into an electrical circuit the current takes two directions—a direct path through the body, and a side circuit over the surface of the body. It is not the shortest way, but the way of least resistance, which is the most important. When the skin is covered with perspiration or moisture, a large portion of the current passes over the surface of the body, and the internal organs do not receive sufficient density of current. Moreover, in electrocution it is usual to employ a metallic helmet filled with cotton-wool drenched with salt solution; this solution runs down over the prisoner's neck and body, thus affording a path of low resistance, which allows the electricity to stream over the surface of the body instead of penetrating it.

Another of the individual factors which determines the gravity of an accidental discharge is that of species. Not only are various types of men very differently affected by the electric discharge, but different species of animals vary greatly in susceptibility. Among the animals on which I have experimented, I found the horse and the white mouse most sensitive to electricity. A horse is readily killed by a current of 100 volts, and a white mouse by 35 volts or less. Dogs and guinea-pigs show much more resistance, nearly as much as fishes and pigeons. On the other hand, I was quite unable to kill either frogs or tortoises by electricity, short of actual burning by the electric light arc.

From numerous experiments I have concluded that death by electricity is really in the first place merely suspended animation, which is later changed into real death.

I now want to show you some of the changes produced by electricity, for they are important not only from the scientific and clinical points of view, but because it is necessary to study them from the forensic standpoint. Electro-pathology plays a very important part in social life. The physician is called upon to give his opinion about an accident, whether it is grave or slight. He may be required to give evidence in the case of a claim being brought by a labourer, and sometimes his advice is sought in cases of self-mutilation in order to get compensation. Electricity is used for suicide and for murder. I show you illustrations of lesions produced by electricity on the skin and tissues. The current also damages bones and viscera. In Vienna we have an electro-pathological museum in the Institute of Medical Jurisprudence, which we find of great use. These are the remains of the clothing of a boy who was struck by lightning, though he was not killed nor even rendered unconscious. Here are two splinters of glass from a window, which were found in the heart of a girl who was said to be killed by lightning. But it was only a so-called "false action" of

lightning.   In the case of accidents from electricity we have been able, owing to the material we have in this museum, to reconstruct the accident.   Once they wrote to us at Vienna, from the University of Lille, for advice in regard to an accident to a boy who was found at a distance of 10 metres from an electric plant, and was said to have been killed by electricity.   We were able to answer that this was possible, and our answer was based upon our experiments upon animals.   Later our opinion was strengthened by the result of our own experience of accidents.   The next picture shows a man working with a bare, uncovered electric wire.   He omitted to take out the safety fuse, and so handled a wire under electric pressure.   Most of the accidents happened through
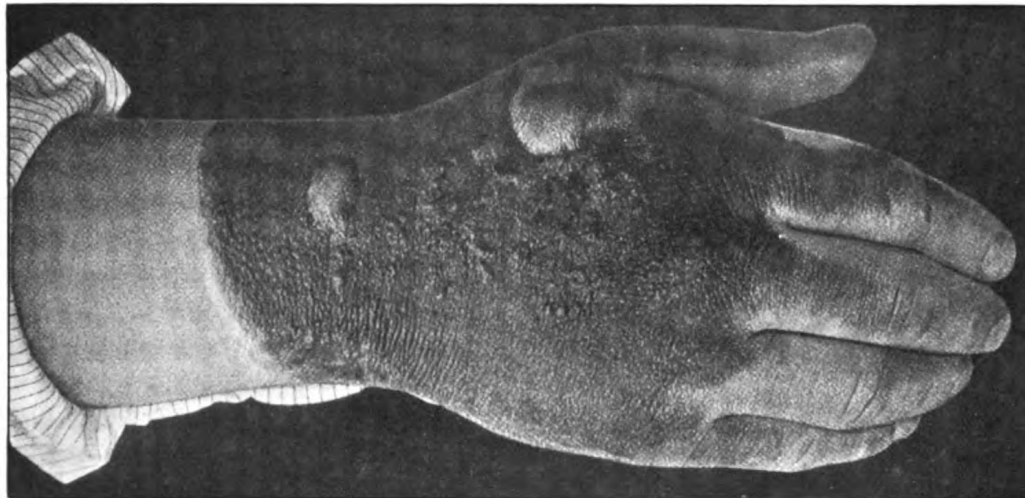
FIG. 1.

Metallic impregnation of the skin of the hand.

carelessness, recklessness, and thoughtlessness.   You see in this way he made a short circuit.   The metal he had in his hand not only melted but volatilized and fell on to his face.   You see the effects it produced. At first sight it looks like a very severe injury, but it turned out to be very slight.   The same changes are seen on his hands.   It is an impregnation of the superficial layers of his skin by volatilized metal (figs. 1 and 2).   In three weeks he had recovered.   The next shows the case of a girl who was killed in her bath.   She touched with her hand the lamp, which was not properly insulated (fig. 3).   When we came to see the body in the bath, the electric lamp lay on the body and was alight. When we lifted the lamp from her body the light went out, and when

we put the lamp back it was again lighted. This diagram shows the method of connexion with earth. In the next case a man, employed in electrical work, was standing on a ladder, and gripped the wire; he immediately fell down dead. Notice the changes on the skin of the sole and the hole burned through the sole of his boot. This was the first fatal accident in Vienna from electricity. In the next case an electrician was employed on a transformer and wore gloves to protect his hands, but the glove did not reach high enough and, his forearm touching the electric conductor, the current passed through his forearm to his axilla. He leaned on the earthed railing and, the current passing
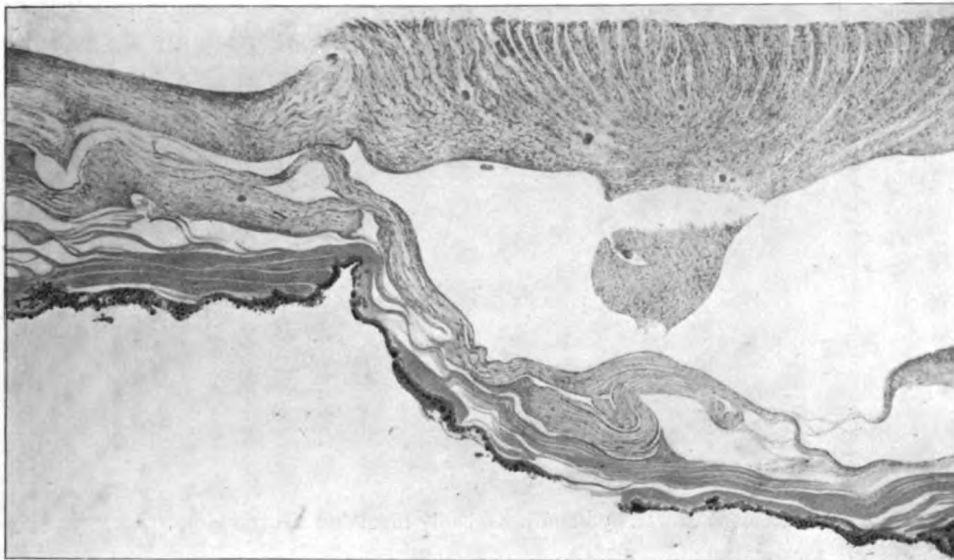
Fig. 2.

Section showing fine metallic particles in the superficial layer of the skin; internal laceration of the skin.

through this, all the rest of his body escaped. I show you the changes in the tissue of the forearm and axilla. The next slide shows the fingers of the left hand of the man whose left side was degenerated and atrophied, but three months later regeneration occurred and he recovered. Two years later the man was able to earn his living again. Next I show you some changes in the joints. We can demonstrate here rarefaction of the bones produced by the electric shock. This tissue change occurs not only in the nervous but also in the vascular system. The next shows a case of self-mutilation. The man wound this round his finger seven times and touched an electric conductor, in order to

convince the inspector that he had had an electric accident. We could not understand how it happened, and eventually the man admitted that it was self-mutilation. The next shows a painter who was employed to paint a post. On this post there are two horns for lightning conductors. They were hidden by the branches and the leaves of the tree, and the man did not see them. Consequently, when he touched the overhead wire the current passed through his left hand, his body, and the post to the earth, and he was instantly killed. Notice the changes in his skin. In the next case the man was engaged in connexion with a cable, and was to signal to his colleague when he was ready; but his colleague did not wait, and turned on the electricity, which passed through the cable through his knee to the earth. Notice the enormous lesion and loss of tissue which were produced. The muscles are wanting, and so are the

Fig. 3.

Accident caused by handling a badly insulated electric lamp.

epicondyles, and the knee-joint is open (fig. 4). He was brought into our hospital, and the surgeon who saw him urged amputation of the knee. I said, " It is not necessary to do that, because these electric lesions have a very favourable course of healing, and generally heal without fever or suppuration." They are all painless. When I began my studies twelve years ago, we made an amputation of the forearm of a man, because we were afraid of suppuration setting in and subsequent septicæmia. But now, with better knowledge, we do not amputate, because we know how favourable the prognosis is in these cases. It was not possible to save this man, because he was so very badly burned over his body by the electric arc light, and he died four days later. You see the lesions on his back are very severe and there is an enormous loss of tissue. Here is a picture of a wound in the neck which looks like one produced by hanging. I call your attention to the wound above the ear.

When the patient was brought in we looked for the lesion produced by the second pole. I could not find it because the wound was covered with quite undamaged hairs. But later there was a scab which revealed the situation of the second wound. These injuries are not always burns, though generally they are when there is an electric spark which comes into contact with the skin. The differentiation is important from a forensic point of view, because these electric lesions are painless. This fact is of use in cases where workmen bring claims for damages on account of wounds which they say are very painful and keep them awake at night. Electrical wounds are not painful. The case here illustrated was that of a man who was working on an iron gallery in a small
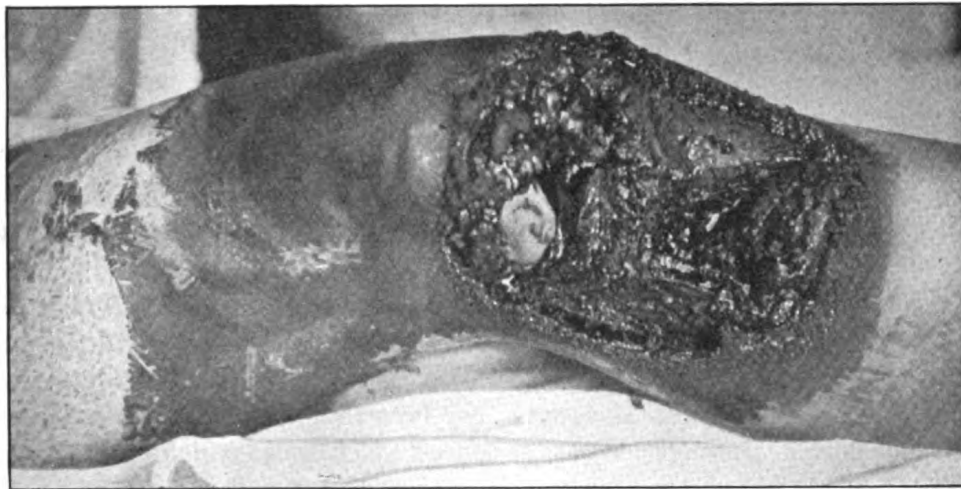
FIG. 4.

Destruction of the knee-joint; metallic impregnation; electrical burns.

room. He touched with his back an electric wire which was insufficiently covered. The current passed from his back to his body, through his body to his feet, and so to the earth, but he did not become unconscious. His clothes were not much damaged, but there were enormous wounds on the body. Notice the changes on his hands where he touched the railings. The body of such a case (a man aged 60) was brought into our Forensic Institute. He was found dead in the factory, and we did not know what had happened. Examination of the hands showed these lesions, and Professor Kolisko said immediately that he was killed by electricity and must have touched an iron railing. Examination of the place showed that this opinion was right. The scar following an electric accident is soft and smooth, and does not shrink.

This, as you know, is very different from the scar of an ordinary burn. I show you slides illustrating this. This man was employed in measuring the copper vase, which was not covered, and, grasping the copper wire, made a short circuit. The result was that the copper melted. By good luck he was wearing glasses, and this saved his eyes. I show you a photograph of the glasses now; the opaque spots are yellow spots which show that the metal got down so deeply into the glass that it could not be removed. The glass is quite impregnated by it. Here is a case of ophthalmia electrica. The next photograph shows recovery four weeks later.

Now I show you the results of microscopical examination. We have seen that there is degeneration of the nerves, and how it is produced. I have examined the brain and spinal cord from a man who was killed by electricity, and I show you here a slide from the medulla oblongata, showing the boundary between the grey and white substance. On this boundary there is a hæmorrhage. You can see also the ganglion cell. The ganglion cell is destroyed, and the nucleus lies outside of the cell. There is a similar destruction in the brain. The next slide is from a guinea-pig which was subjected to the electric current. Here you see the blood which has penetrated into the cell.

Next I show you a slide to demonstrate the strength of the current. Here is a gaspipe which we obtained from the County Council of Dresden, and here is a waterpipe from the City of Erfürt, sent to our Electro-pathological Museum. See how the pipe is broken, and its surface shows corrosions; this is produced by currents which go into the earth, and that this corrosion can be so produced is very important from the hygienic point of view. In Vienna a waterpipe was damaged by this means, and you can understand that if a gaspipe were made to leak in this way, and the gas were ignited by the electricity, the results might be very alarming. The next slide shows a piece of cable, and you see the steel cone, with holes made in it by the labourer's pickaxe, as a result of which there was short-circuiting, and the cable at once destroyed.

I wish now to speak of death by electricity. What is the mechanism of death by electricity? How is death produced? As there are many who have been engaged on this question, so we have many opinions. The first author who worked at this question was the French physician Marat; that was before he became a Revolutionist. He worked with a charge from a Leyden jar, with insulating gloves, and said that death by electricity was death from irritability of muscles. Some say that death by electricity is primarily produced by stoppage of the heart; others say it is by paralysis of respiration; others that it is a paralysis of the brain,

and so forth. I do not agree with any one of them, but I agree with them all together; all are right. Death occupies only a fraction of time. Even if we had a stop-watch we could not differentiate. For instance, a man is struck by lightning, and falls down. He raises himself, and speaks to his companion. If he speaks he must be able to breathe. Then he falls dead, because his heart has stopped. Dispute on this point is quite useless, for everybody is right. In many cases it is apparent death, it is suspended animation, and many victims might have been saved if this idea had been more prevalent. If the physician cannot feel the pulse he often says the man is dead. But if artificial respiration is done, the victim revives. The first case recorded was that by D'Arsonval, of Paris, when he was called to a victim two hours after the accident. This artificial respiration must be continued for hours. Another point I wish to accentuate is this: if a person is struck by electricity, the rescuers run away for a physician, they run to the telephone, &c., instead of immediately commencing artificial respiration. The instructions for first aid which are in use in Austria, and Germany, and America, are not in accordance with present knowledge.

The following are the instructions for first aid in electrical accidents issued by the Union of Austro-Hungarian Electrical Works, according to the resolutions passed at the Congress of Milan in 1909, and Salzburg in 1912, and recommended by the Austrian Government for use in electricity works in June, 1912 :—

First Aid in Electrical Accidents.

(1) Remove the victim from contact with the live wire.

(*a*) Cut off the current at once by opening the nearest switch, by removing the safety fuse, by severing the wire, or by short-circuiting the current. Use an insulated tool, a piece of dry wood, a hatchet with a dry handle, or wire nippers with insulated handles.

(*b*) The rescuer must take the greatest care to see that his own hands and feet are insulated. He should stand on a dry board without nails, a dry coat, carpet, or stool; he should protect his hands with the sleeves of his own coat, a dry cloth, or, better still, india-rubber gloves.

(*c*) The rescuer should place an insulating material under the body of the victim, a dry rug, or sack, or a board without nails or other metal. Sometimes it is possible for the sufferer to tear himself free from the wire by leaping into the air, and dragging himself free while the earth contact is broken, or the rescuer may lift the patient from the ground whilst himself standing on an insulator. He should avoid touching the

sufferer without proper insulation, and on no account should he touch the bare skin without this precaution.   When the sufferer cannot free himself from the contact, each of his fingers should be carefully freed one by one, wrapping each one as it is removed in a dry cloth.

(*d*) If the wire is wound round the victim, it should be removed with well-insulated hands.   The live end of the wire must be held fast or tied back to an insulator in order to avoid further accident.

(2) First aid should be undertaken immediately, and the sufferer must not be left alone even for a moment.

(3) The patient should be laid in a horizontal position, the clothing loosened, and the upper part of the body stripped, so as to admit air and light.

(4) The head of the patient must not be allowed to hang down, but should be slightly raised on a pillow formed of a folded coat.

(5) If the patient is unconscious, means of resuscitation should be adopted at once.

(*a*) The mouth, nose, and throat should be examined to see if the air can enter freely.   Any mucus, food, or false teeth must be carefully removed.

(*b*) On no account must any liquid—water, wine, or brandy—be given to a patient in an unconscious condition.

(*c*) If there is no movement of breathing, artificial respiration must be commenced without a moment's delay.

(*d*) If there is only one rescuer, he should kneel with the head of the patient between his knees.   Taking an elbow of the patient in either hand, he presses them firmly together against the patient's chest ;   he then separates the arms, drawing them sideways and upwards over the patient's head as if the patient were stretching himself ;   the elbows are then again brought into contact and pressed against the patient's chest ;   and these motions of expiration and inspiration are repeated some fifteen times a minute.

(*e*) When there are two helpers, one of these should be sent immediately to fetch a doctor, while the other continues the artificial respiration.

(*f*) With two helpers, one kneels on either side of the patient, each taking one of the patient's arms by the wrist and the middle of the upper arm.   The motions are repeated as above, care being taken that both arms are moved in unison.   These movements should not be too quick, the upward and the downward motion being repeated from fifteen to twenty times a minute.   Any forcible movements or rough pressure on the stomach or liver should be avoided.

(*g*) In case of necessity, artificial respiration should be kept up for two or three hours. Many cases have been saved when the victim has been apparently dead for hours.

(*h*) Where there is only one helper, and he greatly fatigued, he may from time to time make use of another means of artificial respiration. For this he kneels astride the patient, and with a clean handkerchief seizes the patient's tongue with his right hand, the left hand being placed flat on the patient's chest. He now alternately draws the tongue forcibly forwards, and presses with the left hand on the patient's chest, while allowing the tongue to recede. This alternating motion should be repeated twenty times a minute.

(6) Whilst the artificial respiration is being carried on, the second helper should feel and listen for the beat of the heart under the left nipple. If no heart-beat is to be detected, he should immediately proceed to stimulate the surface of the chest over the heart. This may be carried out by rubbing with cold and hot towels alternately, by slapping the surface of the chest with a wet towel, or even striking the neighbourhood of the heart with the closed fist.

(7) Of course, the preceding instructions must be modified if the patient is seriously injured by wounds or broken bones.

(8) The treatment may be varied by stimulation of the soles of the feet, by cold irrigation of the bowel, or by alternately pouring hot and cold water over the chest and abdomen. *In no case should the subsidiary treatment be allowed to interfere with the continuance of artificial respiration.*

(9) During the whole process of restoration the patient should be carefully watched for any return of the natural breathing. The return of consciousness should be encouraged by calling the patient by name, by stimulation of the skin, slapping the chest and face, &c. After the return of consciousness the patient should still be watched, and not left alone. He may have warm drinks—coffee, tea, or a little alcohol—and should remain for some time in a semi-recumbent posture.

(10) The treatment of burns or superficial injuries, which usually follow a very favourable course, should be left to the physician. The only complication which may require first aid is the occurrence of hæmorrhage.

The blood-pressure changes vary according to the tension. Up to 80 volts the blood-pressure rises, but with a higher tension in the same animal the blood-pressure falls, so much so that the heart stops. I have tested in the Physiological Institute of Professor von Tschermak, in

Vienna, not only the pressure in the carotids, but have taken a kymographic tracing of the apex of the heart. You see that when we subject the animal to a voltage of 110 the blood-pressure drops (fig. 5). In a dog we notice the waves are greater, and 80 volts for only a short time give us a fibrillary curve (trémulations fibrillaires). After a few seconds the heart-beat is sometimes better again, especially in a rabbit.

I now wish to call your attention to some experiments I have made, and which I do not myself understand. On subjecting an animal to 110 volts the blood-pressure decreased, and afterwards increased again. When I use that voltage with two poles, one in the mouth and the
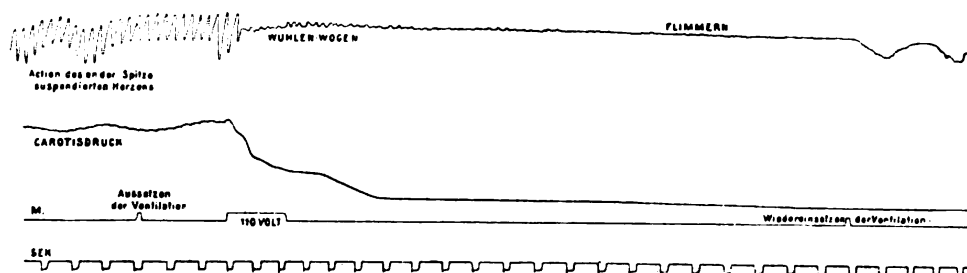
FIG. 5.
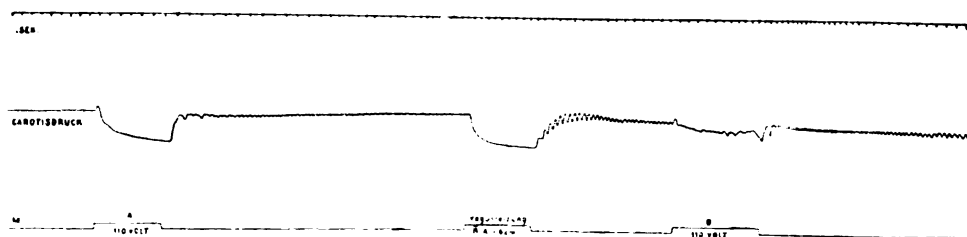
FIG. 6.

other in the rectum, and electrolyse the vagus nerve, the blood-pressure decreases at the same rate. But if I subject the same animal to the danger of a fatal current, we see the absence of this decrease (fig. 6). So all we can say is that we have thus produced an immunization against electricity by electricity. And this seems to me very important. Professor von Tschermak and myself, after chloroforming a dog, opened its skull, and then irritated the fore and hind legs; these curves show every movement, and how long the irritation lasted. I subjected the animal to an electric shock of 120 volts for three seconds. What happened? The blood-pressure rose for a short time, but then decreased continuously until we got this abscissa. I could not indicate the breath-

ing on the one diagram. The spasm of the legs lasted forty-five seconds. I then irritated with a current of medical strength, and you see the result. The movement ceased about one hundred and five seconds after the shock. What can we learn from this? That after the shock the brain is enormously excited, but after this excitement the irritability subsides, and there is decreased susceptibility to electricity (fig. 7). There is a paralysis of the brain, but that paralysis is not definitive, the irritability of the brain returns. So in the case of victims, everything depends on whether the action of the heart returns. The victim falls
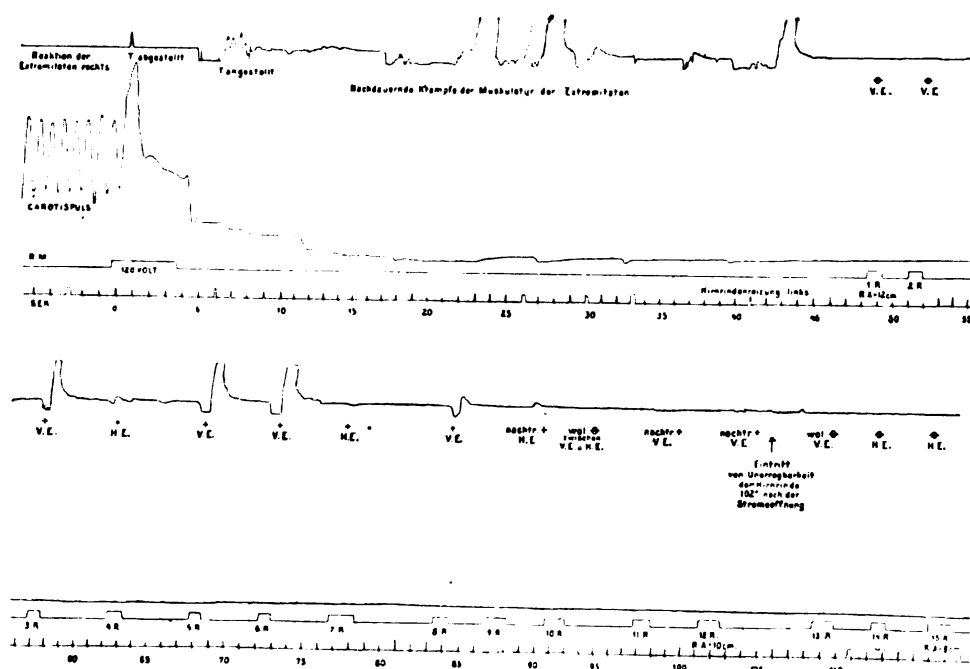
FIG. 7.

down unconscious, but after a time he is able to raise himself up and speak, in spite of the fact that his heart is not beating. But this excitation of the brain cannot last for long, and that is the reason prompt first aid is of such immense importance; it is the critical time— the time of payment to death (Verfallsfristanden Tod). Ten years ago this question had not been decided.

I show you some slides of experiments with the electric current on rabbits; you see the degeneration of the sciatic nerve.

When a victim is struck by an electric current you should know how to free him without becoming yourself implicated; a person seeing

another drown has regard also for his own life. It is not possible to teach in writing how to free the victim of an electric discharge; it should be practically demonstrated to pupils and electricians.[1] Immediately after freeing the victim you must attend to the patient's breathing. If a fellow-workman lays the victim on his face, his efforts at restoration may injure the liver and cause fatal hæmorrhages. Or he may press out the stomach contents. In one case, after an electrical accident in Vienna, the stomach contents were pressed out into the trachea and inspired into the lungs, so that the man was really drowned by his own food-stuffs. The great point I would insist on all through is that efforts at restoration must be commenced at once, and artificial respiration must be done carefully, but not forcibly.

Dr. Jellinek concluded by demonstrating the way in which accidents happened, and the manner of dealing with them, by means of the cinematograph.

DISCUSSION.

Dr. LEWIS JONES said he was sure he could speak for all present in thanking Dr. Jellinek for his paper. The hour was late, but there were one or two points which he might just mention, and one was that the cases he had seen of people who had very serious non-fatal accident did not appear to suffer from any after-effects of a nervous character. He mentioned the point because from time to time he had read accounts of persons bringing legal actions for compensation and describing themselves as suffering from all sorts of nerve symptoms as the sequel of an electric shock. The second point was that in some cases where death was not caused by the primary effect of the electric shock, a fatal result might follow from the very serious thermal effects produced by the passage of large currents through the limbs. A few years ago there was an accident in which a young man received such large currents through his body that the muscles and blood-vessels of the limbs underwent a heat coagulation necessitating amputation. He survived the accident for nine days, and it seemed strange that though the current in that instance had been so great as to raise the temperature of the limb sufficiently to destroy the living tissues, nevertheless the heart had not been arrested by the electric shocks.

Professor SILVANUS THOMPSON said that a great many things which Dr. Jellinek had mentioned had been of extreme interest to him, and though, happily, he had never seen a man killed by electricity, he had seen various

[1] In some schools of Vienna (K. K. Gewerbeförderungsamt und Technolog. Gewerbe Museum) we teach the pupils by means of pictures and lantern slides (from our Electropathological Atlas) how electrical accidents originate and how to avoid them.

accidents of other kinds, where machinery had been put out of order and destroyed. Some seventeen years ago he took out a life policy for himself in a certain insurance office. When the policy came to him to be duly signed, it was found to contain a clause stating that he (Professor Thompson) would on no consideration step upon a switchboard of an electric lighting station. He promptly scored it out and said he would not sign it, as that was his business. The insurance company in the result omitted it. Many people interested in electricity had to go on switchboards from time to time, and he was surprised that the number of accidents in connexion with them were so few, particularly on high-tension switch-boards, considering the risks which the special work-men had to run in fitting and adjusting things on them. He could only conclude that the immunity they had was due to the circumstance that they were mostly highly skilled men, who were able to appreciate the risks which they ran. And that was not all, for at this lecture he had been learning to appreciate that the Government of this country made useful regulations which certainly would have prevented some of the accidents which had been depicted as occurring in Austria. For instance, the fencing of electrical machinery was carried out in this country in a way which was superior to that in any other which he had visited. We had a Home Office, with a Mining Department, and a Board of Trade, which looked after these things. We were apt to blame our Government Departments for their grandmotherly legislation and their details and their inspectors, but it was undoubtedly because we had these things that we were so immune from accidents. Mr. Ram, who was sitting next to him, had for years been adviser to the Home Office, as Mr. Trotter advised the Board of Trade, on questions of this kind; and there were other inspectors for mining. People should reflect, too, that they owed a great deal to the gentlemen who had been put in those positions, for they had, without creating any antagonism on the part of the industry, succeeded in carrying out good and effective rules for the regulation of the dangerous trades. The very first slide thrown on the screen showed an accident which arose from an electric lamp being attached to a gas fitting, a state of affairs which was impossible in this country if the regulations were obeyed. No insurance office would pass an installation of that kind, unless that fitting was detached from the gas pipe, and hung independently from an insulated support. Again we had to thank grandmotherly Government Departments and insurance offices for the advantages we enjoyed of comparative immunity from accidents due to the presence of unprotected conductors. The comparative insensibility to the result of electric stimulation of those who, like himself, were constantly receiving slight charges of electricity, made one wonder whether those who did so were not specially immune from the greater danger.

Mr. G. SCOTT RAM (Electrical Inspector, Factory Department, Home Office) said he was somewhat surprised to notice, from the pictures exhibited, showing the resuscitation of those apparently dead, that the old Silvester method was still advocated. Recently, in this country, Professor Schäfer's method had been adopted very largely for drowning cases, and was

recommended for electric shock. It was now used entirely by the Metropolitan Police. Though he had known of a number of cases of electric shock which had been brought round by the Silvester method, nevertheless the medical men who had given advice to the Home Office and other departments on these matters had pointed out that the Schäfer method had proved so much better in drowning cases, that it must also be better for electricity, and it was now generally recommended. The recommendation was, however, only of recent date, and he had not had actual experience of any case in which the method had been used for electric shock; but that day he was looking at a work recently published by an American, Dr. Lauffer, attached to the Westinghouse Electric Company at Pittsburg, in whose extensive electrical works and stations he had had a wide experience, and he recommended the Schäfer method. Dr. Lauffer gave an example where in one of the works the chief electrician had dealt with six cases of electric shock in which the victim had been rendered insensible, and in every one had been brought round apparently by the Schäfer method. The lecturer did not touch upon the relative dangers of the alternating and the continuous current. It was frequently stated that the continuous current was more dangerous than the alternating; but he did not consider that statement was borne out by the facts. In the last ten years he had had under his notice on premises under the Factory Acts forty-five cases of persons killed by alternating electrical shock at 250 volts or less, as against only three by continuous current, though he believed the alternating current and continuous current were used to about an equal extent. One thing he would like to comment upon, as the lecturer had done so — if he had not he would not have cared to refer to it himself in such an assembly—and that was that if only one person were present, he should not run for the doctor, but, as the lecturer had very rightly insisted, he should commence resuscitation measures without delay. It was also wrong to send the patient, perhaps some distance, to a hospital before he had been brought round, as he might die on the way. In one case which came under his notice a man had a shock at a switch-pillar in the street and was rendered insensible. A policeman was passing at the time and saw it was an electric pillar, and ran across the road and told a doctor what had happened. The doctor told the policeman to take the man to the cottage hospital, which was a mile away. It was half an hour before he could be got there, and he was then pronounced to be dead. That man did not really have a chance. Sometimes medical men did not seem to give these cases sufficient time. He had known cases where a medical man had been sent for and pronounced the patient dead, and had gone away within half an hour of the accident. In one well-authenticated case the victim's friends decided to "have another go at him," and succeeded in restoring him after he had been pronounced dead. One sometimes saw results which it was difficult to account for. The effect of the current must depend on what part of the body it traversed. One recent case, unlike any others he knew, was interesting in the fact that the current did not appear to have passed through any vital part of the body. The ground of certain works had become charged by leakage from a 400-volt alternating three-phase circuit. It was found to be so charged,

and workmen were cautioned against walking over that patch. One man said he did not care and started to walk over it; he fell down and was killed. The current must have passed up one leg and down the other; and it was difficult to understand how it could have gone to his heart, or how it could have interfered with his breathing. He had notes of other interesting cases, but the hour was too late to deal with them.

The PRESIDENT (Dr. Reginald Morton) said he knew that many felt they would like to continue the discussion, but, as had already been said, the hour was late, and before asking Dr. Jellinek to reply he wished to say how deeply the Royal Society of Medicine was indebted to him for coming all the way from Vienna to address them. He knew it had been done at a considerable sacrifice of his valuable time. The address was a masterly production, and it showed that he had done an enormous amount of very careful and painstaking work, and in a manner possible only to a man whose interest in it had practically amounted to a passion. He hoped that the points which Dr. Jellinek had impressed on the meeting would, from that day, be much more widely disseminated. The knowledge of the medical profession on the question of electrical accidents was deplorably small, but this was chiefly because the ordinary practitioner saw so few cases. He might go through his whole professional career without coming across one instance of the kind under discussion. It should be clearly understood that the first thing to do in a case of electric shock was to apply the ordinary simple method of resuscitation, and if that were properly grasped it would be a great gain. Dr. Jellinek had proved that the critical time was the first few seconds or minutes after the shock, and that was pre-eminently the time to act. These facts should be made known throughout the electrical industry as well as the medical profession. Dr. Jellinek showed one photograph which revealed rarefaction of the ends of the bones in the wrists which he said was due to electric shock. No doubt this was correct, but the question which arose in his mind was as to whether it was a primary result of electric shock or secondary to a previous arthritis. [Dr. JELLINEK : I think it was primary.] It should also be remembered that electric wounds were, for the most part, painless ; and when self-mutilation was carried out by this means the patient was almost sure to complain of pain, often saying it produced loss of sleep at night. Though he had been interested in electrical matters for a long time, he had come across only one instance of electrical injury, and that was in a generating station at Taunton, where there was a small 35-kilowatt machine, which the engineer treated with scant respect. One day he made a short circuit, the current passing from little finger to thumb. The wounds were just of the kind Dr. Jellinek had described, quite painless, and healed up in about ten days, with only a little exfoliation. He was sorry Dr. Jellinek had not found time to speak of the psychological effects, for one case had been recorded in which the death of a person occurred when touching a conductor which at the time was quite dead : the victim thought he had touched a live wire and suddenly died. This was an extreme instance of the psychological factor determining

the severity of the accident. The film shown belonged to the Austro-Hungarian Government, and he was sure the meeting would wish to express its deepest gratitude to that Government for allowing it to be brought for the edification of the meeting.

Dr. JELLINEK, in reply, said that Dr. Lewis Jones had mentioned the difference between the effects of high- and low-tension currents ; he agreed it was sometimes difficult to explain why 100 volts were fatal and yet 1,000 volts could be received without much injury. But it was interesting that the danger-point in electrical voltage had not only an inferior but also a superior limit, and it did not seem possible to explain this from a physical standpoint. Professor Silvanus Thompson mentioned accidents on switch-boards, and expressed wonder that they were not more frequent. He was of the same opinion. Though there were accidents enough in Vienna, there were still more in Germany. But he must, in honour of the Austrian Government, and in honour of electro-technicians in Austria, say that the instructions were so excellent that, if they were observed, no accidents would happen. He wished to emphasize his statement that carelessness, recklessness, and thoughtlessness were the chief causes of accidents. Mr. Ram spoke of artificial respiration by Professor Schäfer's method. He knew this method very well, because he once used to employ it ; about three months ago he published a paper[1] in the official journal of the medical faculty of his University on the subject of first aid, and specially discussed the Schäfer method. The ordinary labourer in Austria did not know which was the stomach and which the liver, especially if the victim were lying on his face. In Pittsburg the Westinghouse practice seemed to be to use force, and there was danger of rupturing viscera. They had had fatal accidents from violently carrying out first aid—one after supposed death by lightning. There were, especially in Germany, machines to induce artificial respiration, and there seemed to be the idea that one must procure a promoter ; but one could not have so many promoters that there should be one wherever an accident happened—moreover, precious time was wasted in obtaining the machine. Most of his fatal cases were caused by the continuous current ; and, judging by the chemical action, the corrosive electrolytic action, the continuous current seemed to be more dangerous, but this question was undecided. He did not say "Don't send for the doctor," but "If there is only one person present he should try artificial respiration, and if another person comes, send him for the doctor." His experience agreed with that of Dr. Morton that electrical wounds were painless. He was happy to hear the President mention the fact that his Government had sent the film, and he was glad to be allowed to bring it. It was satisfactory to know that the representative of the Austro-Hungarian ambassador was present, and he would be able to acquaint his Government with what had been said.

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[1] " Die Organisation und Durchführung der ersten Hilfe bei elektrischen Unfällen," *Wien. klin. Wochenschr.*, 1912, xxv, p. 962.

Electro-Therapeutical Section.

December 20, 1912.[1]

Dr. REGINALD MORTON, President of the Section, in the Chair.

Paralysis of the Trapezius from Injury of Spinal Accessory Nerve, and Recovery.

By H. LEWIS JONES, M.D.

THE patient was a young woman who had an injury to the spinal accessory nerve resulting in paralysis of the trapezius. The nerve was sutured, and after a time power had returned. Though the patient had been conscious of improvement, the reactions in the trapezius were not satisfactory until this year. The case could now be regarded as quite cured. The operation was done seven years ago, and for a long time she had had electrical treatment, but lately she had lived at a distance.

Dr. Lewis Jones considered that electrical treatment hastened recovery, provided the nerve was not actually divided. Several years ago he had a case in which there was injury to the musculo-spiral nerve, and for financial considerations he dismissed the patient as soon as he began to improve, telling him that continued progress might be expected if he exercised his arm and had regular massage to it; but if he did not improve he was to report himself. He did not make progress, and so electrical treatment was resumed, when progress again began. That case seemed to prove that the application of electricity accelerated recovery.

Dr. FRED. BAILEY (Brighton) said that fifteen months ago he cut through his ulnar nerve, and commenced treatment very soon after the injury. He noticed that if for any reason treatment had to be suspended, progress was retarded, but within three or four days of resuming the electricity progress had recommenced.

[1] Meeting held at the Middlesex Hospital.

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⌐] Recurrent Carcinoma of the Breast treated by X-rays.

By E. P. Cumberbatch, M.B.

Dr. Walsham had suggested that this patient should be shown as an instance of beneficial action of X-rays in the treatment of recurrent carcinoma of the breast. The left breast was removed in August, 1902. Five years after that she noticed a small lump on the lower end of the scar, just over and below the situation of the apex beat. In 1907 this lump slowly got larger, but she did not come for treatment until August, 1911. Then she came under the charge of Dr. Pirie, now at Montreal. Dr. Cumberbatch saw her for the first time in October, 1911, and noticed that she had a circumscribed lump growing in the skin over the region of the apex beat, the size of half-a-crown. It was raised ¼ in. above the surface, was quite hard, with irregular surface speckled with red points. She had also a number of " melon-seed " bodies scattered under the skin of the left axilla and the front of the chest. He made a careful chart of the growths, and then commenced X-ray treatment. Not until the beginning of last year (1912) did he notice a diminution of the size of the above-mentioned bodies, and by April they had all disappeared. The skin in the region of the larger growth was now faintly hyperæmic, but there was nothing visible there now. Six months ago he saw an enlarged gland above the right clavicle, and small " melon-seed " bodies in the right axilla, and another below the right nipple. Treatment was continued, and in September, 1912, she went under the care of another officer. Since then, one or two fresh nodules had appeared on the left side, but the gland which he had felt above the right clavicle had disappeared. He had given her quite small doses, half to one Sabouraud, unfiltered, once a month. This was one case of a small collection in which the treatment by small doses, infrequently applied, had been effective, but she had weathered the storm much longer than the others—namely, since 1902. One could feel a bony lump over the sternal end of the clavicle, the nature of which he did not know. It came up soon after the operation, and had not increased in size. It had also received X-ray treatment.

DISCUSSION.

Dr. FRANK FOWLER (Bournemouth) said he thought the treatment might have been still more efficient. He gave full pastille doses each time, one over the scar, one in the axilla, and one in the supra-clavicular region. That procedure was always carried out in his hospital even for prophylactic treatment. That full dose was applied to each part once a fortnight. He put the Sabouraud pastille underneath the aluminium.

Dr. FINZI said he gave one and one-third Sabouraud dose of filtered X-rays every fortnight, and that had become easy with the Cyclops tube, as it enabled one to use large currents for a considerable time. The rays were filtered through at least 1 mm. of aluminium.

Mr. GILBERT SCOTT said his experience with-nodular recurrent cases was that when these nodules began to multiply rapidly the patient, as a rule, was dead in six months. He did not regard the lump the size of half-a-crown in this case as a superficial nodule. These nodules appeared as a rule down the neck, and on other parts of the body, and it became a hopeless task to follow them round although with apparently any dose of X-rays they disappeared rapidly. Nodules in the liver usually occurred at this stage.

Dr. FRED. BAILEY said he had a patient in whom nodules had been occurring at intervals for three years. They had disappeared under more or less continuous treatment during that period by *hard* X-rays to the whole area, and radium to the nodules as they appeared. Only two months ago he discovered a fresh nodule, but the patient had kept in fair health and recently had taken quite a strenuous holiday in London.

Dr. NORMAN ALDRIDGE considered that the dosage was determined by how much the skin would stand. His practice was to give half a Sabouraud pastille dose, filtered through 0˙5 mm. of aluminium once a week, and in many cases, after six or seven sittings there was sufficient erythema to justify one in stopping it. His dosage was really the same as Dr. Fowler's, who gave a whole pastille dose once a fortnight. But he also had had several cases in which he had to suspend the treatment after six or seven sittings owing to the erythema and inflammation; in one case this proceeded to some destruction of the skin. His practice had been to give the largest dose the skin would stand, and in many cases that was not more than half a pastille once a week. He had a patient who had gone on with that for more than two years. In that case there were recurrent nodules in the breast area, but they disappeared after less than twelve doses. Then symptoms pointed to metastasis in the stomach, and later, in the lungs. He followed these up with the rays, and there had been no burning of the skin, nothing more than a browning of it.

Dr. IRONSIDE BRUCE said it had surprised him to hear the statement that the size of the X-ray dose should be determined by what the skin could stand in cases in which the treatment was employed to influence tissues deep

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in the skin, because by proper filtration large doses could be given without producing any skin reaction. He could show cases which had been exposed through a felt filter twice a week, for three or four months, without any skin change—cases of exophthalmic goitre. He did not think anyone would know, from looking at the skin, that they had been irradiated. To see the effect of the maximum X-ray dose he had given a half-hour exposure, from a tube running at 5 ma. through a filter, consisting of 4 in. thickness of felt, without causing more than a slight reddening of the skin.

The PRESIDENT (Dr. Reginald Morton) said that the case was remarkable in many ways, particularly in regard to the small doses given and the long intervals between. Mr. Cumberbatch used no filters, and theoretically that seemed right for these superficial nodules, for one wanted absorption to take place. One should not, therefore, use a filter to absorb the rays which otherwise would be stopped by the superficial layers of the skin. The other interesting point was the dosage, and how long it could be given without causing burning of the skin. He had used metallic screens himself in the past, but had abandoned them, because when using them one was always being troubled with dermatitis when least expected, and that interrupted the treatment. His results had been better since he employed non-metallic screens. He now scarcely knew what it was to cause even hyperæmia. The X-ray treatment of malignant disease was a very important subject, and it was a pity the Section had not set aside a whole evening to its debate. There was need for much more accurate knowledge. The tubes were a variable quantity, and neither these nor filtration were fully understood. Nor did one know exactly the quality of ray which was being absorbed into the tissues, and until a standardized system was established, the X-ray therapeutist would be groping in the dark. For screening, Dr. Ironside Bruce used thick layers of felt. He (Dr. Morton) had tried them, and they were satisfactory, but he liked a thinner material, and so he used lint which had been saturated with a solution of tungstate of soda and dried. It must contain a metal of high atomic weight. He used from one to three, four, or six layers of this, according to the degree of screening required. It was also very cheap, and separate pieces could be used for each patient. If those who used metallic screens and had dermatitis in their cases would use non-metallic ones, that trouble would disappear. One speaker said he put the pastille dose close to the metallic screen but underneath it. He (Dr. Morton) thought that was wrong, as there was radiation from the metal which affected the pastille.

The Treatment of Exophthalmic Goitre.

By W. N. Kingsbury.

THE underlying pathology of exophthalmic goitre is not even yet fully determined. It has been ascribed to a central lesion in the medulla oblongata; while, on the other hand, it has been regarded as a pure neurosis. Moebius and Greenfield have stated that it is primarily a disease of the thyroid, and this seems to be the view which Kocher also takes. Whatever the actual cause of the disease may be, the fact remains that, in practically every case, at some time or other, some enlargement of the thyroid gland can be made out.

The histology of the normal thyroid may very briefly be epitomized as follows : The gland is covered with a capsule of dense areolar tissue which sends in fibrous trabeculæ. These trabeculæ enclose the vesicles. The vesicles are round or oblong irregular sacs, and consist of a wall of thin, delicate, hyaline membrane, apparently non-cellular, lined by a single layer of short, cylindrical or cubical cells. The vesicles are filled with transparent colloid material. The active principle is probably that substance separated by Baumann and known as thyro-iodine. It is present in the colloid substance in combination with protein matter. Asher and Flack say they have proved that there exists an internal secretion in the thyroid which may be activated by irritation of nerves going to vessels as well as to epithelium. Hugo Wiener has found that, after the excision of the inferior cervical sympathetic ganglion the thyreoglobulin of the thyroid is greatly diminished, as is also the total quantity of iodine. This is not the case after excision of the superior cervical ganglion, and he therefore concludes that the secreting fibres ascend probably from the fifth and sixth cervical nerves.

The changes in the thyroid gland in Graves's disease, as shown by Greenfield, are those of an organ in active evolution. Increased proliferation of the cells lining the vesicles occurs. The cells become cylindrical instead of being cubical. The vesicles themselves become branched or stellate, and their contents lose their colloid nature and become mucous and granular. These changes, according to Edmunds, resemble those which occur in compensatory hypertrophy after partial excision of the gland.

Thyroid extract given in excess produces the following symptoms : Tachycardia of the physiological type of Lewis, headache, tremor, sweating, prostration, loss of weight, and increased nitrogenous output due to increased protein katabolism. Edmunds has observed exophthalmos produced in monkeys and dogs as the result of excessive administration of thyroid substance. Béclère has reported a case in which this symptom developed in man after overdosing with thyroid extract. When we consider that practically all the symptoms of Graves's disease which cause the discomfort and disability of which the patient complains—those symptoms which prevent her from following her ordinary occupation and which, if not controlled, may lead to yet more serious results—can be produced in a normal individual or in a myxœdematous patient, by the administration of excessive doses of thyroid extract, I think we come to a logical conclusion if we consider that these symptoms are due to the excessive secretion and to the pouring into the blood of larger amounts than normal of the hormone elaborated by the thyroid. Kocher, in a paper read in the latter part of 1910 before the Surgical Section of the British Medical Association,[1] adduces strong evidence to show that the above conclusion is probably a correct one. He quotes from the work done by Bruns, Baumgarten, and de Lignevis to show that Graves's disease can be produced in nervous people with goitre by the administration of iodine. This symptom-complex, artificially produced, he terms " Iodine Basedow." It must, however, be remembered that closely associated with the thyroid are the parathyroid glands. These may be involved in Graves's disease, and it is difficult to say exactly what the relation is. It is possible, however, that they are responsible for some, at any rate, of the nervous symptoms. Be this as it may, they participate with the thyroid in the action of the X-rays when the patient is so treated.

The symptoms of Graves's disease do not always make their appearance in the same order, nor do they subside in the same way when the disease is being cured. As a rule, the first symptom to appear is the tachycardia, which at first always, and even after a prolonged time in most cases, is of the physiological type. This is generally followed by exophthalmos, by the obvious enlargement of the thyroid and tremor. In established cases Kocher reports a definite blood change. There is a diminution in the number of polymorphonuclear cells from a normal 5,000 to 1,000 per cubic millimetre, while the small mono-

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[1] *Brit. Med. Journ.*, 1910, ii, pp. 931-35.

nuclear cells show a relative increase from 20 per cent. in normal blood to 50 per cent. This change is not absolute, for in undoubted cases of Graves's disease it may not be present, but these cases are exceptional. Probably, during the process of cure, the cardiac symptoms are the first to subside. The exophthalmos then improves, and the thyroid may regain its normal size, but this sequence may be varied. Thus, then, if the symptoms of Graves's disease are—and, I think, we are logical in assuming that they are—due to excessive discharge of thyroid hormone, it will follow that if it is possible to diminish the output of this substance we shall considerably relieve our patient. Until comparatively recently the treatment of exophthalmic goitre was purely medicinal.

Electrical treatment, in the form of galvanism to the thyroid, and to the cervical sympathetic, was tried with, in some cases, favourable results. Let us consider the results obtained by means of medical treatment. Medicinal measures are notoriously uncertain and frankly disappointing. The drugs advocated are numerous. They range from digitalis to rodagen and thyroidectin. Now where we find a multiplicity of drugs recommended as being worthy of trial in any disease we may be fairly certain that the good results ensuing after the exhibition of any or many of them are not particularly striking. Hector Mackenzie states that, as the result of treatment of patients in hospital, 35 per cent. were cured, or were almost cured, and not more than 25 per cent. ended fatally.

A later stage in the treatment of Graves's disease was reached when this complaint came within the domain of the surgeon. Until a short time ago, when the physician despaired of curing his patient, or when the patient got tired of being treated with drugs, the aid of the surgeon was invoked. The results of surgery are good, but it is not a very uncommon occurrence for a patient who had previously shown no signs of Graves's disease to develop exophthalmic goitre after an operation. This sudden onset may also occur after a severe shock, or after great excitement. Kocher explains this phenomenon by the theory that an increased metabolism of the nervous system, such as might arise from sudden or prolonged nervous exhaustion, produces toxic substances which, when they reach the thyroid, stimulate it to increased activity. Again, surgical interference is inseparable from the attendant worry and anxiety with which most patients, and those suffering from Graves's disease in particular, look forward to an operation. The risk from the anæsthetic—a risk emphasized by the fact that the thymus is very often enlarged in these cases, when a condition approaching status

lymphaticus obtains—and the shock after the operation, are not to be looked upon lightly. Kocher, in his first 170 cases of operations on exophthalmic goitre, had a mortality of 5 per cent. This has certainly come down in his more recent cases, and the mortality of his total number, 469 up to end of 1910, was 3·4 per cent. Mackenzie states that of thirteen cases operated on at St. Thomas's Hospital five improved, three were left *in statu quo*, and five ended fatally. Hale White gives four deaths out of eleven operations. Rehn says that in severe cases the mortality is as high as 22 per cent. McWilliam collected 1,055 cases operated upon by Kocher, Crile, Mayo, and others, with a mortality of 4 per cent.

Despite the fact that the results of surgery are good, are we justified, in the face of these statistics, in recommending our patients either to submit to operation or to undergo medical treatment if we can offer them any other line of treatment which will give results anything like comparable with those of surgery ?

The operation usually performed is, I believe, one either of partial thyroidectomy or of ligature of one or more of the thyroid arteries, usually the former method. Both of these operations have, as their basis, the object of diminishing the output of the internal secretion. We find that, in old cases of Graves's disease which have got well, the thyroid shows an increased formation of fibrous tissue with a certain amount of cystic change. Can we produce, more quickly than Nature, without the disadvantages of surgical procedure, a similar result ? As far as I can make out this is exactly the condition produced in the thyroid after it has been X-rayed. And surely the treatment of an enlarged thyroid with X-rays is simple enough, without the worry and anxiety inseparable from the anticipation of the operation and without the risk of anæsthetic. Moreover, the action of the X-rays does not stop at this imitation of Nature in the production of fibrous tissue. Its inhibitive action on cell activity is one of its best known results, as evidenced by its action on the testicles, hair-follicles, &c. In this way, then, can the hyperactivity of the gland be controlled.

· Rowntree, in his work on the " Histology of X-ray Dermatitis," [1] has shown an increase in the nuclei of the fixed connective tissue cells in the scalp, subjected to several exposures. In a portion of skin from a finger, amputated for X-ray carcinoma, he states that there was marked increase in the thickness of the deeper-lying vessels, while the corium was

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[1] *Arch. Middlesex Hosp.*, 1909, xv, pp. 192-99.

represented by a cellular connective tissue in which all the normal structures had disappeared. There were no masses of plasma cells or leucocytic infiltration. The connective tissue approached ordinary scar tissue in general appearance. He suggests that his specimens show a progressive series of changes in the two types of tissue present, epithelium and connective tissue. The changes in the epithelium, he states, are of a retrogressive nature, while the changes in the connective tissue are formative in character. This may give some clue to the changes in the thyroid after irradiation, and may explain the diminution of secretion by the direct action on the cells lining the vesicles, helped by the contraction of freshly formed connective tissue. The changes observed in the deeper blood-vessels may obtain in the thyroid and further contribute to the causes of the lessened formation of the hormone by diminishing the blood supply. This change may conceivably be due to secondary radiations set up in the vessels themselves as the result of impact of the γ radiations. In most cases, after being treated with X-rays, the thyroid, after a time, becomes definitely smaller and occasionally it reverts to its normal size. In other cases it remains large after all the other symptoms have cleared up.

Sir Alfred Pearce Gould recently operated on a case of Graves's disease which had been treated with X-rays and practically cured. He operated because the patient complained of dyspnœa after she had been so treated. He found that the thyroid generally was harder than normal and that the isthmus was practically converted into a fibrous band which stretched across the trachea, and by contracting had pressed upon it and thus caused the dyspnœa complained of by the patient.

As regards the method of treatment, all our patients, with one exception, have been able to come down to the Department to be treated. We have not, as yet, fully determined whether full pastille doses given once in three weeks, or half pastille doses—i.e., in point of time—given once or twice a week, afford the better results. Our series of cases is not yet long enough to enable us to give preference to either, and, moreover, since the pastille dose was given in all our first cases, those which have been having half pastille doses are, for the most part, at present in the process of being treated. The patient is X-rayed, first one side of the neck, and at the next sitting on the other side, and so on alternately. The anode is placed 7 to 8 in. away from the skin : 0·3 to 0·7 ma. of current are going through the secondary. A fairly hard tube is used, one whose equivalent spark-gap is not less than 5 in. No filter

beyond the air has been interposed between the skin and the tube in this series of cases. An erythema is occasionally produced, but the patient is carefully watched, and no further untoward effects have resulted.

During the past twelve months we have treated seventeen cases of exophthalmic goitre in the Electrical Department, some as in-patients and some as out-patients. Of these seventeen patients two discontinued treatment before there was any probability of finding any improvement. Of the remainder eight were treated as in-patients. Three of these were practically cured before they left the hospital, and the others continued treatment after their discharge. One of these has since stopped treatment and is practically well. One discontinued after two pastille doses as out-patient, and was much relieved. The remainder are still under treatment, and are all improving.

Thus, then, of fifteen cases, eight were treated as in-patients in the first instance, and some continued treatment as out-patients. Of these, four were cured, one was much relieved, and three are still under treatment and are all improving. Seven were treated as out-patients, of whom one improved, but relapsed and was operated on; one had four pastille doses, and then discontinued (was much better); five are being treated now, and with one exception are improving.

To sum up, of fifteen cases, four are cured, two much relieved, eight still under treatment (one doing well, one not improving very much), one improved, but relapsed and was operated upon.

Although these results are not quite so strikingly good as those of Dr. Stoney yet they are better than the results of medicinal treatment, and practically as good as those achieved by operation, without the disadvantages of the latter procedure. Dr. Stoney[1] reports out of forty-one cases: fourteen completely cured; twenty-two cases derived great benefit; four were unsatisfactory; one did not do well, was operated upon, and died; thus giving a percentage of 87·8 who resumed their ordinary method of living. Many of our patients have only come for treatment during the past three months, and these have not yet had a sufficient number of exposures for the desired effect. It seems that the best results are obtained when the patient is at rest in bed, free from the worry of home, and is well fed and looked after.

Perhaps the most striking feature about these cases, in-patients and out-patients, is that after only a very few exposures they practically all

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[1] *Brit. Med. Journ.*, 1912, ii, p. 476.

Initials of patient	In-patient or out-patient	Dose	Pulse before	Pulse after	Neck	Eye signs	Remarks
M. G.	In-patient	Pastilles 4	132	82	13½ to 13⅜ in.	Unchanged	Says she feels better; discharged as much improved
M. P.	Out-patient	11	116	88	No note	No note	Made slight improvement and felt better; relapsed and was operated upon
C. R.	In-patient	8	102	100	17¾ to 16½ in.	Exophthalmos much less	Tremor disappeared; thyroid was smaller and firmer; was on police force and went back to work; is the only man in the force, as far as I can find, who has returned to duty after exophthalmic goitre
E. A.	In-patient	7	144	108	No note of exact measurement; said to be good deal smaller	Exophthalmos disappeared	Tremor much less, and gland smaller; was the only patient too ill to come down for treatment; was treated in ward and did very well; was seen a few days ago, is doing her usual work and is practically cured
A. L.	In-patient	6½	102	92	No note	No note	Tremor less; had 2½ pastilles as out-patient, and then stopped treatment; was much better
E. B.	In-patient	11	158	92	Neck smaller	Exophthalmos less	Less pulsation in thyroid; was sent out after being nearly three months an in-patient; could do nothing when she first went home, but can now do a little house work; still being treated
S. D.	In-patient	5	168	126	13¼ to 12⅞ in.	*In statu quo*	Tremor unaltered, feels much better; being treated as an out-patient
G. T.	In-patient	2½	—	—	—	—	Has not since been treated
A. T.	In-patient	4	132	92	No note	No note	Had 2 pastilles while an in-patient, and has since been treated as an out-patient; much improved
K. S.	In-patient	10	102	88	13 to 12½ in.	*In statu quo*	Tremor less; had 2 pastilles, and has since been treated as an out-patient; feels better, doing ordinary work
C. T.	Out-patient	5	124	100	No note	Exophthalmos less	Tremor less, feels better
E. S.	Out-patient	7½	120	110	12⅝ to 12¼ in.	Exophthalmos less	Tremor slightly better, feels better, palpitation better, and sleeps fairly well; lost 3 lb. since being under treatment, but has had a good deal of worry
M. M.	Out-patient	3	106	100	Neck smaller	No eye signs	Tremor persists; patient is improving
L. J.	Out-patient	9½	104	132	No note	Not marked	Feels better, but there is more tachycardia and she has lost 4 lb.
S. P.	Out-patient	3	—	—	—	—	Of this patient I have no notes
E. S.	Out-patient	4	—	—	—	—	Not seen since; at last appearance there is a note to the effect that she is much better
W. A.	Out-patient	10	146	130	14 to 13½ in.	Exophthalmos less	Tremors less; feels better and is now working

Of these, 13 show a definite diminution in pulse-rate; 7 show some diminution in the neck measurement around the biggest circumference; in 2 more it is stated to be less; 6 show that the exophthalmos has become less, and in 1 it disappeared.

volunteer the statement that they " feel better." This may possibly be a psychic phenomenon, but, in view of the fact that they make progressive improvement, and one or more of their symptoms have diminished, I think it is more probably a matter of actual fact than due to suggestion.

In future we propose to have a blood count—i.e., a differential count —of the leucocytes made both before, and at different times during, treatment, and observations are being made on the excretion of creatinine and creatin as affording some idea of the endogenous nitrogenous metabolism. As I have already pointed out, in most cases of exophthalmic goitre the thymus is enlarged. In future cases we propose to attempt to X-ray this gland as well as the thyroid.

Quite recently Regaud and Cremieu have done experimental work on kittens, and have produced a progressive reduction of the thymus after a moderate amount of irradiation. Larger and successive doses reduce the thymus to such a degree that no sign of regeneration has been seen after two months. From this experimental work they have gone on to treat the thymic hypertrophy of infants and the size is said to be notably diminished after the second day.

The treatment of Graves's disease by means of X-rays is not a new one, and it has been carried out by you for some time past. I have here recorded nothing fresh, but I have attempted first to trace out the relationship existing between the thyroid in health, in Graves's disease, and again in Graves's disease after treatment with X-rays ; and, secondly, to compare the medical and surgical treatment with treatment by irradiation, and to place before you, as far as I can, the results of X-ray treatment in this Department during the past twelve months.

Of the many insufficiencies and shortcomings of this paper I am well aware ; for them I alone am responsible. For the rest I wish to express my thanks and gratitude to Mr. Lyster for his help and advice both in the treatment of the patients and in preparing this paper, and to Dr. J. Strickland Goodall for his help regarding the histology of the normal thyroid.

Electro-Therapeutical Section.

January 17, 1913.

Dr. REGINALD MORTON, President of the Section, in the Chair.

The Use of Condenser Discharges in Electrical Testing.

By H. LEWIS JONES, M.D.

THE subject of my discourse is the use of condenser discharges for the testing of nerve and muscle, and I hope to show that the condenser method possesses advantages which are destined to render obsolete the present method of testing by induction coil and continuous current discharges. That method has been in vogue for more than forty years, for I find that in 1868 the phrase "reaction of degeneration" was used by Erb, to whom we owe the method of testing which we have relied upon up to the present time.

The advantages which the condenser method offers are the following : Firstly, it is more rapid ; secondly, it is more precise; thirdly, it gives more information ; and last, but not least, it is far less painful to the person tested.

I need not waste time in enumerating the disadvantages of electrical testing by the old method. The defects of induction coil currents, the doubts as to whether the results given by different coils are strictly comparable one with another, the uncertain meaning of the loss of response to coil currents and of the survival of the response to continuous currents, are sufficient examples of the disadvantages to which I refer, and with which you are all familiar.

The principle upon which the testing of muscle by condenser discharges is based is quite simple. A condenser of known capacity is charged, from the main or from a battery, to a constant voltage, and is then discharged through the muscle. The electrodes used are those we are familiar with, and they are applied to the motor points in the usual manner, or to the distal tendon when the longitudinal reaction is being investigated. A contraction is produced when the capacity of the condenser is sufficiently great and the production or non-production

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of a contraction is all that is looked for.   There is no need to use one's judgment to help one to decide whether the contraction produced should be called sluggish or not sluggish, and this makes for simplicity.

The character of the wave of discharge of a condenser is well defined; it is determined by the resistance of the circuit through which the discharge takes place, and by the capacity of the condenser.   Its height, but not its duration, is determined by the potential to which the condenser is charged.   When the charging potential is constant, and the resistance of the circuit is constant, the waves of discharge become longer as the capacity used becomes greater.   Fig. 1 shows the discharge waves of four condensers whose capacities are as 1, 2, 3, 4, as they occur under the conditions of electrical testing of nerve and muscle.   One can see that they differ only in their durations.   This being so, we at once can recognize the possibility of using condensers for applying to a muscle a series of discharges alike in other respects but with durations which may range from the shortest possible to the longest, if only we can provide ourselves with a series of condensers having a sufficiently wide range of capacities; and if we keep our charging voltage constant, and the resistance of the patient remains constant, the discharges will be identical discharges in all other respects except that of length or duration.

It is easy to keep the charging voltage constant, and also easy to keep the resistance of the patient constant, because for these brief discharges there is no polarization, and the resistance of the body under the conditions of the case is singularly constant, being less than 1,000 ohms in the ordinary procedure of testing if the electrodes are kept in good contact and at uniform pressure.   The question of the resistance of the body to momentary currents is a very interesting one, which has been well dealt with by Dubois, of Berne, and his conclusions, from which my figures are taken, may be accepted as being quite satisfactory.   There is not now time to refer further to the investigations of Dubois on the resistance of the body to currents of short duration, but they may be found in a paper in the *Annales d'Electrobiologie* for March, 1899.

If we apply to a healthy muscle a series of discharges, using condensers of increasing capacity, the contractions all appear very much alike, except that the larger capacities produce stronger muscular contractions, but if we do the same to muscles which are more or less damaged we find that they do not respond to the smallest capacities, but that they still respond to the larger capacities and the process of

testing with condensers therefore consists of ascertaining the magnitude of the least capacity which is required to produce a visible contraction in a given muscle. When a charging potential of 100 volts is used, the normal, or almost normal, muscles react with capacities between 0·01 and 0·08 micro-farad (hundredths of a micro-farad), the muscles with partial reaction of degeneration react between 0·1 and 0·8 (tenths of a micro-farad), and the muscles with complete and profound reaction of degeneration may require 1, 2, 3 micro-farads, or even more, before they respond.

Translated into length of waves, this means that a muscle responding first with a capacity of 1 micro-farad requires a wave one hundred times as long as that necessary to excite a normal muscle, which reacts to 0·01 of a micro-farad. By using a battery of condensers ranging from 0·01 to 2 micro-farads with ten intermediate steps of capacity, we are placed in the possession of a range of twelve different wave lengths,
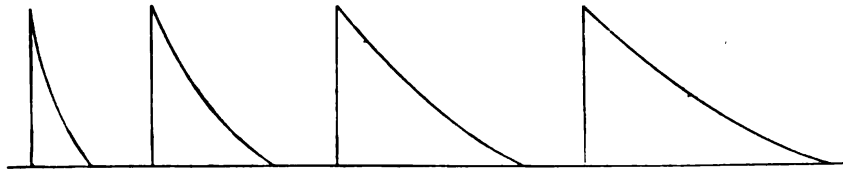
Fig. 1.

Discharge curves of condensers when their capacities are in the ratios of 1, 2, 3, 4, with constant voltage and constant resistance.

and soon discover, on practical trial, that muscles occur which may require any one of these different lengths of wave for the production of their first visible contraction. We thus acquire a method which allows of the ready recognition of twelve different degrees of muscular excitability, instead of the three grades of "normal," partial R.D. (reaction of degeneration) and complete R.D., with which we have hitherto been satisfied. The values which I have taken for the twelve capacities are as follows :—

No.			Capacity				Discharge duration
1	...	...	0·016 micro-farad	...	...	$\frac{1}{24000}$ second	
2	...	...	0·025	,,	...	...	$\frac{1}{16000}$,,
3	...	...	0·05	,,	...	...	$\frac{1}{8000}$,,
4	...	...	0·062	,,	...	...	$\frac{1}{6000}$,,
5	...	...	0·08	,,	...	...	$\frac{1}{4800}$,,
6	...	...	0·125	,,	...	...	$\frac{1}{3200}$,,
7	...	...	0·25	,,	...	...	$\frac{1}{1600}$,,
8	...	...	0·33	,,	...	...	$\frac{1}{1200}$,,
9	...	...	0·5	,,	...	...	$\frac{1}{800}$,,
10	...	...	0·66	,,	...	...	$\frac{1}{600}$,,
11	...	...	1·0	,,	...	...	$\frac{1}{400}$,,
12	...	...	2·0	,,	...	...	$\frac{1}{200}$,,

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These durations of discharge are approximate only, but serve to indicate the general order of the values. If these durations are compared with the wave lengths of induction coil discharges, one is struck by the fact that the small capacities, to which normal muscles readily respond, give waves which are much shorter in their duration than those of medical coils. The waves of most medical coils last about $\frac{1}{400}$ second, and even if the effective part of them is only half of this, say $\frac{1}{800}$ second, that duration is still too great to reveal the slighter degrees of deviation from the normal, and as is doubtless apparent to all those who have thought about the subject, we reach the conclusion that muscles have been reported as normal during all these years of electrical testing, although they have, in many cases, been by no means normal, the reason being that we have been unable to appreciate their real condition, much less to express their abnormality in any numerical way.

The electrical testing we have been using, which I now propose to call the old way of testing, has been based upon the interrogation of the muscular contractility by applying to it the short waves of the induction coil and the long waves of the closure of the continuous current. We have not known the wave length of either, or at least we have made no attempt to control it, and our short waves have not been short enough, while our long waves have been too long.

Minimum capacity, micro-farads		Muscle			Minimum wave duration seconds
0·02 to 0·05	...	Thigh muscles	...	...	$\frac{1}{10000}$ to $\frac{1}{8000}$
0·08	...	Interossei		...	$\frac{1}{4800}$
0·1	...	{ Gastrocnemius / Soleus }	...	...	$\frac{1}{3200}$
0·25	...	Peronei		...	$\frac{1}{1600}$
1·0	...	{ Tibialis posticus / Flexor communis digitorum }		...	$\frac{1}{400}$
2·0	...	{ Tibialis anticus / Extensor longus digitorum / Extensor proprius hallucis }		...	$\frac{1}{200}$

This is a report of a condenser test of the leg and foot muscles of a patient with partial paralysis of one leg, due, probably, to a lesion of the grey matter of the lumbar enlargement. The old test showed complete R.D. in the anterior tibial group, poor normal responses in the peronei and the intrinsics of the foot, and partial R.D. in the calf muscles. It can be seen that the condenser test gives a much fuller account of the condition of his muscles, and one which can be drawn up in the form of a report expressed in simple numbers. The figures are

given in fractions of a micro-farad and are also translated into figures of time in fractions of a second. Dr. Cumberbatch, who has helped me in my work with condenser testing, has promised to give other examples, at the end of my paper, of results obtained by him at St. Bartholomew's Hospital, and Dr. R. S. Woods, of the Electrical Department of the London Hospital, has also given me the most valuable help and, I hope, will also contribute to our collection of facts directly.

It would be easy to devote a considerable time to a discussion in detail of the various points of interest which one can see to be developing out of the study of the testing of muscles by condenser discharges, but I do not wish to encumber my subject, and on this occasion it
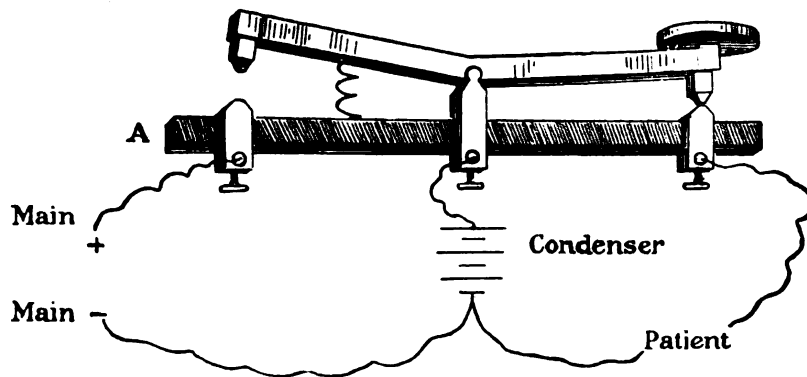
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Plan of Morse key for charging and discharging a condenser.

is better, I think, that we should confine our attention to the most practical and fundamental points.

I have here an apparatus for testing by the new method. It consists of a box much like a battery box, with twelve studs, and containing twelve condensers of the capacities already mentioned, with a moving arm for bringing any one of them into action. The condensers are charged from the source and discharged through the patient by a Morse key, an instrument which makes two alternative contacts in turn, the one for the charge and the other for the discharge. The Morse key may be adapted to a testing handle or used as a metronome, or converted into a special revolving commutator, and I have here examples of each. My own preference is for the metronome form, with wires dipping into mercury cups. When the contacts are kept clean it makes and breaks the circuits very well, but care must be observed in its use, for the

patient may get a severe shock if the dipping-in wires are so long as to connect both the end cups at one time, for then they form a bridge which can convey the full current of the charging source to the patient. This danger can be avoided by the observance of the rule of always making trial of the current on one's self before touching the patient.

The use of the metronome in all kinds of electrical testing is to be recommended. I have so used it for several years, and consider it more handy than an electrode fitted with a closing key on the handle ; and the tick-tack of the metronome is useful as it gives an audible signal to the operator which tells him when the muscular contraction should appear, and also by the rhythmic sequence of the impulses one is enabled to distinguish muscular movements due to the testing current from any other accidental voluntary movements of the patient.

I should now like to explain my reasons for choosing the particular values of the condensers which make up the testing box. They are arbitrarily chosen, and it is possible that some day other values may be preferred, but in an investigation of this kind one has to begin by feeling one's way, for there are not many indications in the literature to guide one in the choice of the best values.

Mr. Leslie Miller has given me great help in the manufacture of the boxes, of which I have used several with different arrangements of condensers, and the figures placed before you represent my present views as to what constitutes a suitable set. In the first place, I think that a range of twelve capacities is enough to begin with, and the chief question has been how best to distribute the values in a set of twelve, beginning with about 0·01 and ending with 2 micro-farads. So far most of the interesting differences which I have met with in the muscular responses come between 0·05 and 1 micro-farad.

In view of the difficulties of obtaining small capacities which are cheap and reliable, I have adopted a special plan of construction—namely, that of arranging my capacities in series. There is a formula for the capacity of a number of capacities in series which is not difficult to utilize. It is this :—

$$C = \cfrac{1}{\dfrac{1}{C_1} + \dfrac{1}{C_2} + \dfrac{1}{C_3} + \dfrac{1}{C_4} \text{ \&c.}}$$

C being the capacity of the combined series, and C_1, C_2, C_3, &c., being the capacities of the components. Thus the capacity of two condensers in series, when each is of 2 micro-farads, is 1 micro-farad, and my box is made up of the following units—viz., four of 2 micro-farads, two of

1 micro-farad, four of $\frac{1}{4}$ micro-farad, and two of $\frac{1}{20}$ micro-farad. These, in series, give the fractions contained in the box. Except for the smallest they are commercial sizes, they are uniform in capacity, neatly made, free from leakage, and in the series arrangement their individual errors tend to neutralize out. This is a valuable point. I think it so important that different investigators should have identical instruments that I favour this special method of construction. The manufacture of condensers, or rather the standardizing of them, is very difficult for such small sizes as 0˙01 or 0˙02 micro-farad, and these sizes are not made commercially as are the larger ones of $\frac{1}{4}$ micro-farad and upwards. In my arrangement the smallest size used is 0˙05 micro-farad, which can be made reasonably easily. The voltage I have chosen is 100 volts, but other voltages may be used, and if other voltages are used the results obtained can be made comparable by expressing them all in durations of time. I hope soon to prepare a table with which we can compare 100 volts with 120, 200, and 240 volts.

With 200 volts instead of 100 the only change necessary in the construction of the testing-box would be the provision of one more condenser at the smallest end. On 240 volts a capacity of 0˙005 gives the threshold of contraction, as I am informed by Professor Cluzet, who tells me he uses 240 volts in his condenser testing.

There are certain points to be considered in the special case of muscles showing a profound reaction of degeneration. Cluzet touches on this point, and tells us that there are some cases of this kind in which no response is produced even by the largest capacities, although a response can be excited by the closure of a continuous current.

I have also found this to be the case and have tried to get over the difficulty, the essence of which is as follows: In extreme R.D. the excitability of the muscle has fallen so much that the condenser discharge even of 2 micro-farads ($\frac{1}{200}$ second) is still too short to excite a contraction. With larger condensers one could get longer waves, but with 2 micro-farads at 100 volts the discharges are already disagreeably strong, and provoke much movement in neighbouring healthy muscles, which tends to obscure the clearness of the test. I therefore decided to seek a means of prolonging the duration of the discharge from the largest-sized condenser, without increasing the shock to the surrounding healthy muscles, and the best way of doing this is by the introduction of a resistance in series with the patient. A very good way is as follows : Raise the charging voltage from 100 volts to 200, which is easy on most electric lighting systems. Introduce

into the patient's circuit a resistance of several thousand ohms and proceed as before. The initial shock is reduced by the added resistance, and the duration of the discharge is extended. Thus with 100 volts and 2 micro-farads, and the patient's resistance taken at 1,000 ohms, the duration will be $\frac{1}{200}$ second, with 1,000 ohms added it will be $\frac{1}{100}$ second, and with 4,000 ohms added the duration will be five times as long as at first, or $\frac{1}{40}$ second, but the initial value of the discharge will be proportionately reduced, because the charge in the condenser is obliged to escape more slowly. The effect upon healthy muscles will be much reduced, and the effect upon the R.D. muscles will be reduced to a less degree. By raising the voltage to 200 we keep our long waves and double their initial value, and in general will succeed by this way in provoking the looked-for contraction, even in very degenerate muscles.

This procedure is quite easy in practice, and Dr. Cumberbatch has been testing its value upon some cases, and has some facts bearing on the matter which I hope he will contribute to the discussion directly. In some such way as this we may hope to overcome the difficulty of the non-response of very degenerate muscles to condenser discharges.

And now, gentlemen, I want you to understand that what I have been telling you to-night is not in any way my discovery. All I have done is to put before you, I hope in a simple and clear manner, the present position of condenser testing. The position is not one which has been rapidly attained, and many workers have contributed to its attainment. Only to mention a few, I would at least name to you Boudet de Pâris (Paris, 1888), Hoorweg (Utrecht, 1899), Dubois (Berne), Zanietowski (Prague), Doumer (Lille), and Cluzet (Lyons).

Much of the early work with condensers dealt chiefly with the physiological and the mathematical aspect of the problem, and the papers, involving, as they do in some instances, a knowledge of differential equations, logarithms, and trigonometry, and dealing much with the search for a mathematical formula to express the co-efficient of excitability of nerve and muscle, have perhaps tended to discourage clinical workers from taking up the subject for practical use. It was a paper by Professor Cluzet, in the *Paris Médical* of April, 1912, which awakened in me a lively interest in the possibilities of practical condenser testing. In that paper a form of testing apparatus for clinical use is figured, the general effect of condensers of different capacities upon damaged muscles is stated, and the essential principles of the method of practical clinical testing are described. In what I have given you

to-day I have tried to expand that subject, to amplify some of the details, to select definite values for the condensers used, and to contribute some results of my own experience, in the hope of calling the attention of workers in this country to an important new development.

There is much work to be done in the way of testing muscles by both methods, the old and the new, in order to compare them together. This has hardly been begun yet, but I have already seen enough to convince me that the use of condensers in testing will yield much new knowledge, valuable both for diagnosis and prognosis, and will entirely supersede the old method of electrical testing. It will also probably bring out some new points of diagnostic value which we do not as yet suspect, and quite possibly will show us some discrepancies from what we now regard as the settled order of muscular excitability in disease. It remains for us in this country to advance still further the progress which has already been made.

Other ways of using condensers for testing have been proposed, as, for instance, by varying the voltage, instead of the capacity; or by using two condensers, one large and one small, and observing the effect of introducing resistances. But to my mind none of these are so simple as the method I have laid before you of varying the capacity in a regular series, while maintaining everything else uniform.

Those who are interested in pursuing these methods further may consult the numerous papers of Zanietowski, and should also see a paper by Doumer in the *Annales d'Electrobiologie* for April, 1911.

RESULTS OBTAINED BY TESTING BY MEANS OF CONDENSER DIS-CHARGES, AND THEIR COMPARISON WITH THOSE OBTAINED BY THE OLDER METHOD.

Dr. E. P. CUMBERBATCH demonstrated on the epidiascope charts of testings of patients. The first table showed the results obtained from a test made both by means of condenser discharges and by currents from coil and cells. The test was made upon certain muscles of a patient suffering probably from progressive muscular atrophy. Some of the muscles, when tested by the older method, gave normal reactions; others gave a partial R.D.; others a complete R.D. But when the same muscles were tested by discharges from condensers of varying capacity, it was possible to place a number against each muscle, as seen in the table, representing the capacity of the smallest condenser to the discharge of which the muscle would contract. The muscles contracting to the

larger capacity condensers gave a complete R.D. reaction ; those contracting to the smaller capacity condensers gave a normal reaction. But it was on the remaining muscles that the condenser method gave the most helpful information. These muscles responded to coil currents, but with currents from cells it was often a matter of personal judgment whether the response was sluggish or not. These muscles responded to discharges from different condensers which were all of medium capacity.

TABLE I.

		Condenser charged to 100 volts			Reaction to coil and cells
Hand	...	Intrinsics (median nerve)	2·00	...	Complete R.D.
		Intrinsics (ulnar nerve)	3·00		
Forearm	...	Flexor carpi ulnaris	0·05	...	Probably partial R.D.
		Flexor carpi radialis	0·07		
		Flexor sublimis digitorum	0·50		
		Extensor carpi ulnaris	0·10		
		Remaining extensors	0·25		
Arm...	...	Triceps	0·10	...	Partial R.D.
		Biceps	0·50		
Face	...	Facial muscles	0·02	...	Normal
Foot	...	Interossei	0·07	...	Normal
		Extensor brevis digitorum	0·07		
Leg ...	...	Extensor communis digitorum	0·25	...	Partial R.D.
		Tibialis anticus	0·50		
		Peronei	0·70		
		Calf muscles	0·25		
		Tibialis posticus	0·25		
Thigh	...	Quadriceps	0·25	...	Probably partial R.D.
		Adductors	0·10	...	Partial R.D.
		Hamstrings	0·50		

The second table shows the result obtained from a test made upon some of the leg muscles of a patient who was suffering from the results of anterior poliomyelitis. In the first part of the table is recorded the results obtained when testing by the older method. When tested by condensers charged to 100 volts (as in the preceding case) it was found that none of the muscles of the left leg would respond even when the largest capacity condenser was used. Evidently these muscles were so torpid as to require a discharge still slower than that which the largest capacity condenser could give. By introducing resistances, successively increasing in amount, into the discharging circuit, and charging the condensers to 200 volts instead of 100 volts, it was found that some of these torpid muscles would respond until, with 5,000 ohms in the circuit, all responded.

TABLE II.

	Reactions to coil and cells		
	Right side		Left side
Tibialis anticus	Weak normal	...	Complete R.D.
Extensor longus digitorum ...	Weak normal	...	Complete R.D.
Extensor longus hallucis ...	Weak normal	...	Complete R.D.
Peronei	Weak normal	...	Complete R.D.
Calf muscles	Complete R.D.	...	Complete R.D.

	100 volts, no extra resistance		200 volts, 1,000 ohms in circuit		200 volts, 2,000 ohms in circuit	
	Right	Left	Right	Left	Right	Left
Tibialis anticus	0·02	No contraction obtained even with the largest capacity condenser	0·01	? 2·00	0·01	2·00
Extensor longus digitorum ...	0·05		0·02	No contraction	Not tested	No contraction
Extensor longus hallucis ...	0·02		0·01	1·00	Not tested	1·00
Peronei	0·02		0·01	No contraction	Not tested	No contraction
Calf muscles	0·25		0·07	No contraction	Not tested	No contraction

	200 volts, 3,000 ohms in circuit		200 volts, 4,000 ohms in circuit	200 volts, 5,000 ohms in circuit	
	Right	Left		Right	Left
Tibialis anticus	0·02	? 1·00		0·02	2·00
Extensor longus digitorum ...	Not tested	2·00	Results similar to those shown in preceding column	0·05	2·00
Extensor longus hallucis ...	Not tested	0·50		0·05	0·50
Peronei	Not tested	2·00		0·02	2·00
Calf muscles	Not tested	No contraction		0·10 (very slight)	3·00

DISCUSSION.

Dr. R. S. WOODS (London Hospital) said that Dr. Lewis Jones had given him the opportunity of using the condenser method in the case of some of his (Dr. Woods's) patients. He had used the method of condenser testing only with Dr. Lewis Jones, but from what he had seen of it he realized that it would revolutionize muscle testing. It seemed that it not only made more definite the line between normal and abnormal muscle, but enabled one to divide up the muscles which formerly were classed as abnormal into a graded series, from those verging on to the normal to those in which, with even large condenser discharges, no response at all was obtained.

Dr. FRED. BAILEY (Brighton) said that, seventeen months ago, he severed his own left ulnar nerve. It was sutured at once and healing was satisfactory; since the operation recovery had taken place in the usual ordinary sequence, faradic response returned in the intrinsic muscles of the hand eleven months after operation. Four months later, fifteen months after suture, there was but slight difference to be discovered, as to faradic response, in the left hand intrinsic muscles as compared with the right. However, when tested by Dr. Lewis Jones with his condenser apparatus, while the sound hand intrinsics responded to the smallest condenser discharge (i.e., with the switch on No. 1 stud, about 0'01 micro-farad), the affected hand intrinsics did not respond lower than No. 6 stud (? about 0'1 micro-farad). One month later the same muscles responded with the switch on No. 4, showing a definite improvement in one month which could not otherwise have been demonstrated. He obtained a similar apparatus from Mr. Miller and had satisfied himself that the method had a considerable future before it, both because· it showed these delicate differences in muscle response and also because it was painless.

The PRESIDENT (Dr. Reginald Morton) said it afforded him great pleasure to offer Dr. Lewis Jones his congratulations on the work he had done in connexion with this important subject. The question of testing muscles by means of condenser discharges had been " in the air" for a long time; he believed he heard of it as soon as he took up electrical testing. But it was then so hedged about with logarithms and other difficulties that it was apt to frighten a non-mathematical person. Until he had a conversation on the matter with Dr. Lewis Jones recently, he had only a vague idea as to how it could be used. The greatest credit was due to Dr. Lewis Jones for the simple and practical way in which he had developed this matter. It was thus now a practical method, quite simple and comprehensible to clinicians. He foresaw that the time was at hand when one's ideas as to degeneration of muscle must be readjusted. They had been dissatisfied in the past with their three stages —normal, partial R.D., complete R.D.—and instead of this coarse division it would now be possible to separate out muscle responses more exactly, and perhaps even to number them 1, 2, 3, &c. He had often felt dissatisfied when sending in reports with the mere statement that certain muscles showed more or less R.D. It seemed to him crude, and detracted much from the pleasure and interest of electrical testing. What had specially appealed to him was the author's method of lengthening the wave. In conversation, Dr. Lewis Jones had just given him a rough but simple method of keeping in one's mind what constituted a normal and a partial degeneration. It was that one could call response to hundreds of a micro-farad normal; to tenths of a micro-farad partial, and to micro-farads only, complete degeneration. That was a convenient guide to bear in mind. He proposed that the Section accord its hearty thanks to Dr. Lewis Jones.

Dr. LEWIS JONES, in reply, thanked the members of the Section for their appreciation of his efforts to explain the subject of condenser testing. He was

sure it would be found worthy of attention. A great value of the method was the abolition of much of the pain usually associated with electrical testing, and which was distressing to operator as well as patient. At the hospital there were so many children the subjects of infantile paralysis in whom it was a great pleasure to see smiles substituted for tears during the process of testing. When the capacities required reached 1 or 2 micro-farads there was some stinging sensation, but most of the testing called for did not hurt. Dr. Bailey had reminded the meeting of his own case, and he was the first patient upon whom he had had the opportunity of testing the method after he got his first condenser set. Dr. Bailey came and said he had recovered normal reactions in his muscles, but the condenser test showed a considerable deviation from a true normal. A month later the condenser enabled him to recognize an improvement in this respect, which was not recognizable with induction currents. Happily, the whole question of condenser testing was so simple that it had not needed a long paper to explain it. He hoped that in a few months' time individual members of the Section would come forward with reports of cases which they had tested, both with the old and the new methods, and so contribute to a more detailed knowledge.

Secondary X-rays from Animal Tissues.[1]

By S. Russ, D.Sc.

EVIDENCE is gradually accumulating to show that the biological effects associated with different types of radiation (those from radium and X-rays) run parallel with the ionizing power of the rays. The very easily absorbed rays, efficient from the ionization aspect, are responsible for more marked biological effects than are those of a penetrating character.

When a primary beam of X-rays is incident upon a substance, it is found that the substance emits in all directions a secondary X-radiation. This radiation may be identical in character with the primary beam, in which case it is known as scattered primary radiation; it may, however, have properties peculiar to the constituent elements of the substance. Barkla has shown that all elements of higher atomic weight than forty emit a "characteristic homogeneous radiation" when stimulated by a suitable primary radiation; the lower the atomic weight, the softer is this characteristic radiation. Whiddington has produced evidence that aluminium (at. wt. 27) emits a characteristic radiation and, as anticipated from Barkla's work, it is of a very soft type.

The tissues of the body consisting for the most part of elements of low atomic weight, it is not to be anticipated that the passage of a beam of X-rays through the tissues would excite any easily recognized characteristic homogeneous rays in them; consequently, if any differences in the secondary radiation from various tissues are detectable, these differences may, in all probability, be attributed to their variable mineral content.

Some preliminary measurements have been made of the secondary rays emitted by various tissues (of the sheep) when traversed by a primary beam of X-rays issuing from an ordinary focus bulb under a spark-gap of 9 cm.; this corresponds to a radiation of medium hardness. The method by which this has been done may be seen from fig. 1. A primary beam from the anode strikes a specimen of tissue (T), placed in a thin mica dish 1·5 cm. deep, fixed 10 cm. vertically below a gold-leaf electroscope (E). A portion of the secondary rays emitted by the

[1] Part of this work was done during the tenure of a Beit Memorial Fellowship (communicated at the meeting of the Section on December 20, 1912).

tissue emerges through a hole in a lead screen, which may be covered over with sheets of aluminium (A) when required. These rays enter the electroscope, ionize the air in it and cause the gradual fall of the gold leaf, the rate of motion of which is a measure of the extent of the ionization. The electroscope was, with the exception of a light frame-work, made of tissue-paper, the object being to avoid the production of any tertiary rays by the secondary rays which are under observation. The ionization having been measured, sheets of aluminium were placed over the aperture and the gradual reduction in the ionization measured. In this way the penetrating power of the secondary radiation was found.

In fig. 2 will be seen the curves of absorption for water, blood, and bone. The two former are, under these particular experimental con-
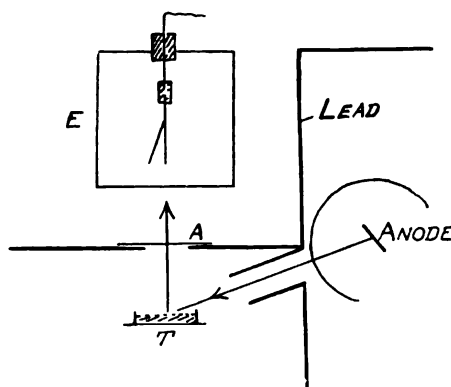
FIG. 1.

ditions, indistinguishable in character and, as will be seen later, indicate that the primary beam has been scattered by these substances without any alteration in its character. The sudden fall in the ionization caused by the rays emitted from powdered bone is probably due to the calcium contained in it. The characteristic homogeneous rays from calcium are, according to Barkla, very soft and would be more than half absorbed by the 10 cm. of air separating the surface of the material from the base of the electroscope. Except for this soft constituent, the secondary radiation is found to be scattered primary radiation.

On the same diagram are shown two examples of the characteristic homogeneous rays excited in metals by the same primary beam. It is seen that this type of radiation from lead and bismuth is very easily absorbed. These selections have been made as being of special clinical interest. Lead is occasionally used for screening purposes, and the

possibility of danger in this procedure is apparent when it is remembered
that the production of this soft radiation continues through the different
layers of a screen, and the emergent portion may be of considerable
intensity. Such secondary rays are also excited by the gamma-rays
of radium. The introduction of bismuth into the body for radiographic
purposes has another aspect of interest, in that it is a localized source
of a very soft radiation upon the passage of the primary beam.
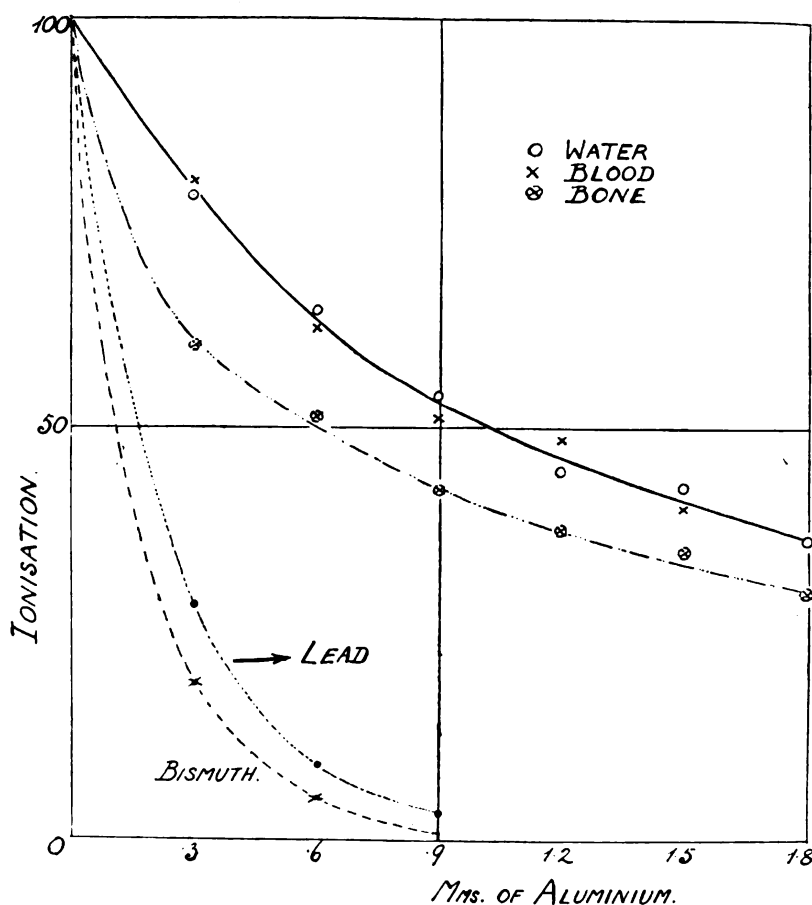
FIG. 2.

In fig. 3 the full line curves I, II and III represent the curves
of absorption by aluminium of the secondary rays from spleen under
various experimental conditions. Curve I is for natural spleen, and it
will be seen by comparison with fig. 2 that the secondary radiation does
not differ markedly from that of water and blood. This similarity pro-
bably being due to the large amount of water in the tissue normally, the

specimen was treated with acetone, which removes the water and fat; the extract was dried and powdered, and its secondary rays again measured, with the result shown in curve II. There are now indications of a soft constituent among the purely scattered rays, the presence of which was previously difficult to be sure of, owing to the preponderance of the scattered rays from the water. Upon incineration of
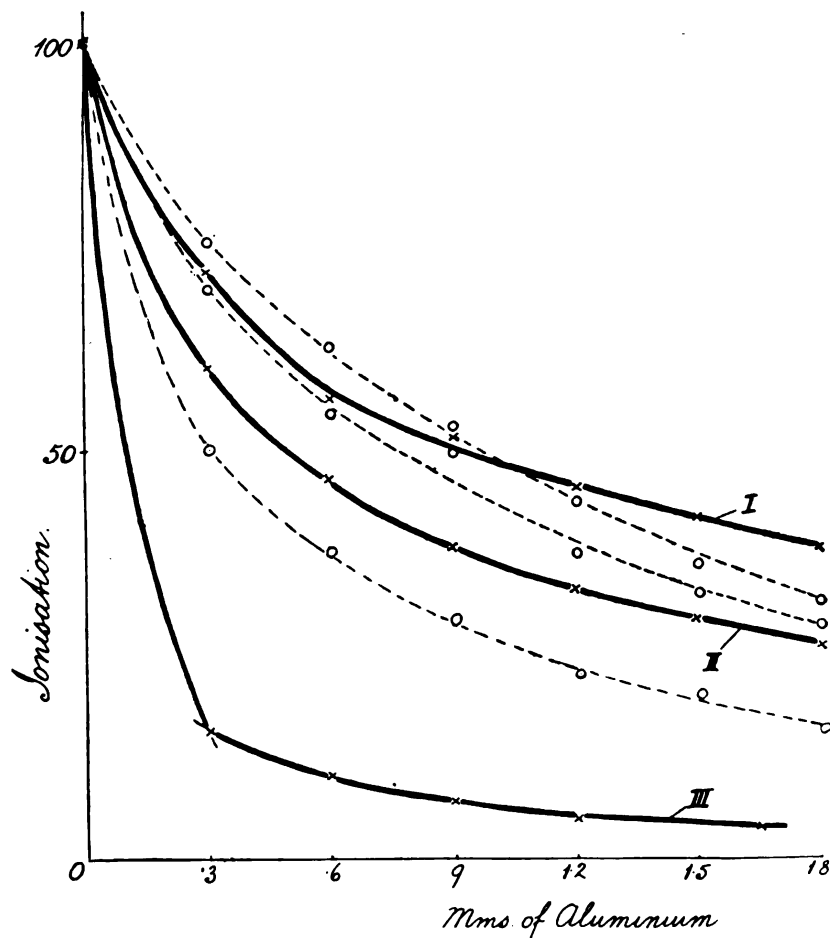
Fɪɢ. 3.

the spleen powder this soft radiation was now found to constitute the bulk of the measured secondary radiation, *vide* curve III, the remainder probably being due to scattered rays from the carbon. The very soft secondary rays are probably attributable to the iron present in the spleen, the presence of which in the incinerated material was detected without difficulty by the ordinary chemical tests. Owing to lack of

observations for very small thicknesses of aluminium, it is not possible to give the co-efficient of absorption for these soft rays. In the same figure the dotted curves represent the secondary radiation from kidney, when measured under the conditions detailed for spleen. It will be seen that the changes in the character of the measured radiation are less marked than in the previous case.
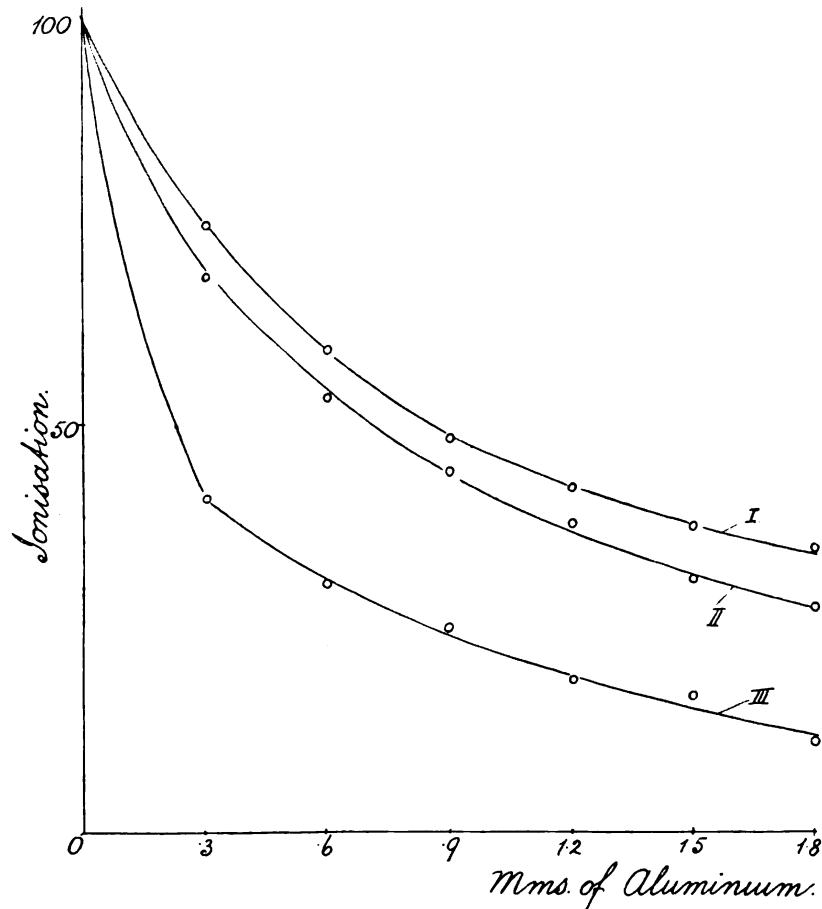
FIG. 4.

In fig. 4 the curves I, II and III represent the results obtained by a similar procedure with normal liver (I), then dried (II) and incinerated (III). The changes are similar to those obtained with spleen, but they are not so marked, although rather more significant than in the case for kidney. When measurements on these lines are made of the radiation from blood, the soft radiation, common to the above tissues, is also apparent.

All these observations have been made with a bulb running at a spark-gap very near to 9 cm. From some previous measurements[1] it has been shown that when the soft constituents of the beam of X-rays issuing from a bulb running at 8·5 cm. spark-gap were cut out by 0·56 mm. of aluminium, the bulk of the remaining radiation had a mean co-efficient of absorption, $\lambda = 5·6$ cm.$^{-1}$ From other data also obtained for spark-gaps of 4·5 and 19 cm. it is found, by interpolation, that at 9 cm. this constant would have the value 5 cm.$^{-1}$ very nearly. When the secondary rays from the substances (with their normally contained water) under examination are examined *in the same manner*, it is found that the co-efficient λ has the following values :—

Secondary radiation from					Value of λ in cm.$^{-1}$
Water—Blood	...	...	...	...	4·8
Bone	...	...	...	...	4·4
Liver	...	...	...	...	4·6
Kidney	...	...	...	...	5·6
Spleen	...	...	...	...	3·6

With the exception of spleen these values do not vary more than about 10 per cent. from the value 5, which indicates that the secondary rays measured were practically identical in character with the primary radiation falling upon the tissues. The low value (3·6) for the spleen suggests that apart from the very soft radiation due to the iron, the secondary rays are appreciably more penetrating than for the other cases. This may be due to some selective absorption of the softer constituents of the primary beam by the spleen. This selective action, which has been shown by Barkla and Sadler[2] to be a general one, would have the effect of hardening the original primary beam, the indications of which would be a diminished value of λ. This view is put forward in lieu of suggesting the presence of some substance normally present in the spleen which emits a hard type of secondary rays.

Of the various tissues examined, bone and spleen give the most marked evidence of secondary radiation other than scattered primary rays. I am informed that the irradiation of the spleen in cases where it is enlarged may be followed by a reduction in its size. To what extent or in what manner the particular secondary rays in question are effective in this process of reduction it is not yet possible to estimate,

[1] *Journ. of Röntgen Soc.*, 1912, viii, No. 31.

[2] *Philosoph. Mag.*, May, 1909.

but it seems not unlikely that there is some association between this clinical fact and the especially favourable conditions for its irradiation that this organ exhibits.

At the meeting on December 20, 1912, a demonstration was given by the author of the secondary radiation from various substances, and in connexion with the question of the rays given off from metals he supported Dr. R. Morton, who had advocated the abandonment of metal screens in clinical practice. Every piece of metal near a patient being irradiated is potentially an X-ray bulb, and usually a very soft one. The conclusion seems justified that the ideal screen is one composed exclusively of the light elements; compressed paper fulfils this condition.

Electro-Therapeutical Section.

February 21, 1913.

Dr. REGINALD MORTON, President of the Section, in the Chair.

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A Discussion on the Use of X-rays in the Diagnosis of Pulmonary Tuberculosis.

Opened by Sir RICHARD DOUGLAS POWELL, Bt., K.C.V.O., M.D.

THERE has been no greater gain to science in recent times than the discovery of the Röntgen rays, and the promptness with which that discovery has been utilized in the interests of medical science, the zeal, ability and enterprise, not unattended with personal danger and even sacrifice of life and limb, with which " truth in the inward parts " has been pursued will form a bright record amongst the many great achievements of modern medicine. I do not, however, come here to extol or to question the value of X-ray work, but having been asked to introduce this discussion from the point of view of the general clinician I could not do so without expressing my appreciation, as one who has taken no part whatever in the work, of the many valuable contributions it has made to improved accuracy in diagnosis and precision in treatment. Perhaps I may usefully at once state the position that X-ray examination seems to me to hold with regard to the diagnosis of pulmonary tuberculosis :—

(1) Its object is to concentrate in one view the physical conditions present in the lungs and thus to replace, or correct, or confirm the findings of physical examination by percussion and auscultation. It is contended that the X-ray view is more exact and comprehensive than can be given by any other physical examination.

(a) There is, I think, some truth in this, especially from a screen view with perfect instruments and skill, where the lungs are observed in action and the penetrability to air of their several parts can be examined.

MH—9

It is not impossible that a cinematograph film might be prepared from a succession of flash X-ray photographs which would demonstrate to a class a living picture of the thoracic organs.

(*b*) Much importance is attached to the position and relative fixity of the diaphragm on the affected side as shown by the screen even in early tuberculosis. I have for many years been in the habit of testing this mobility of diaphragm by maintained percussion at the extreme limits during inspiration and expiration, and do not, as a rule, find it altered in very early stages except where there has been pleurisy or the lower lobe is involved.

(*c*) Impaired movement at the apex can perhaps be better observed by ordinary inspection.

(*d*) Auscultatory examination appears to me to have an advantage over photography by the estimation of crepitant sounds and the character of râles, or their absence, as evidence of activity.

Is an earlier stage of tuberculosis to be recognized by the radiographic method than by auscultation ? In this, as in the similar claim for bacterial examination of sputum, it is a question of give and take, the one method is or should be supplemental to and confirmatory of the other.

(2) It is maintained by Dr. Jordan (who has, I believe, given us the latest word on this subject) that he has demonstrated by X-ray examination that :—

(*a*) All persons—even those in apparent health—have peribronchial tuberculous glands and streaks of fibrous thickening radiating from them.

(*b*) In 118 out of 150 cases of undoubted pulmonary tuberculosis which he examined consecutively, the disease had started in the neighbourhood of the peribronchial glands, and secondary peribronchial infection followed, spreading to the periphery. In fifty-nine of these cases the tuberculous lesion was limited to the peribronchial (mediastinal) region and its near neighbourhood.

(*c*) In only thirty-two cases could the lesion be said to be restricted to the apices.

I should like to know how far these views are endorsed by other radiographic experts. They are not in accord with my experience, but I have some difficulty in contesting them, because Dr. Jordan states (February, 1912) : " At the present day the X-ray appearances are definite and exact ; the X-ray findings are facts," which leaves little to be said.

But I will state my difficulties. And first I will quote from

Dr. Jordan's most recent paper,[1] a reprint of which he has kindly sent me, my attention having originally been attracted to his paper in the *Practitioner* for February, 1912. " The glands and other structures at the hilus have to deal with a continuous tuberculous invasion throughout life. Many are able to cope with the invasion, but in the case of some the tissues are not able to offer effective resistance, or the tissues are receiving a greater number of tubercle bacilli than they can destroy ; these become the subjects of pulmonary tuberculosis. In every case the invasion takes place by way of the hilus. In my former paper I showed that in at least 40 per cent. of cases of phthisis the disease commences as definite peribronchial mottling. From the hilus the disease spreads in all directions, but most rapidly along the ascending and descending branch of the main bronchus. Sooner or later the disease reaches the apex (by way of the ascending bronchiole) ; it then extends rapidly at the apex, so that very soon the apex appears, clinically, to be the chief seat of the invasion."

The recognition of disease in health is an interesting rather than a useful achievement, but there are other obstructions and infections in the bronchial glands besides tubercle. One cannot feel surprised at the rarity with which the bronchial glands are found to be quite normal. It must be borne in mind that they are the dustbins of the broncho-pulmonary tracts. They are also the lethal chambers of tubercle and other organisms. But to maintain that they are always or generally tuberculous is, I believe, quite beyond the truth.

(*a*) Are X-ray findings facts ? I have always regarded them as shadows which have to be rightly interpreted.

(*b*) Is there any post-mortem evidence in favour of the view that tuberculosis generally, or at all frequently, or even ever, commences in the bronchial glands[2] and extends therefrom to distant centres in the lung ? I am aware that children, and perhaps adults, may get their bronchial glands very early affected, although rarely primarily, more often secondarily to bronchial attack, and that tuberculous infection not uncommonly supervenes. A general pulmonary tuberculosis may result through conveyance of tubercle bacilli from the glands

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[1] " On Peribronchial Phthisis," *Brit. Med. Journ.*, 1912, ii, p. 484.

[2] This is not quite the contention of Dr. Jordan, as I ascertained in conversation with him afterwards, he believing that the first portions of lung involved are peribronchial portions near the hilus which lead to the gland involvement and extend also peripherally. The quotation I have read does not seem to me to carry this meaning, and Dr. Murray Leslie and others would, I believe, maintain the primary gland origin.

to the blood-stream, or the tuberculosis may have an independent infective origin. But that infection should thus locally spread against the lymph-currents from the glands into the lung is new to me.

(c) I cannot say that I am convinced by Dr. Jordan's photographs, which are very beautiful impressions: it is the interpretation with which I am at issue.

(3) X-ray impressions are indelible—like all instrumental records— and one is inclined to say, " There the thing is, and it is no use arguing about it. The machine just records and cannot make a mistake." But a very little experience of instrumental work, cardiographic, sphygmographic, or radiographic, makes us familiar with the fact that the man behind the machine—be he never so skilful—may make mistakes, and still more readily may make misinterpretations; and instruments, therefore, must be kept as our servants, not our masters. " Things are not (always) what they seem."

With the beautiful and costly instalments now available at our great hospitals and the great experience and profound skill of the operators, mechanism-mistakes will become more rare, and if due caution be taken to collate all the other evidences relating to each individual case the physical signs depicted will be rightly construed.

In some few cases of early differential diagnosis in regard to pulmonary tuberculosis, I believe X-ray examination to be valuable. In many other conditions in the course of tuberculosis its aid may be sought with advantage.

(a) On the first point I have in mind two cases in which the aid of X-ray examination would have been useful in recognizing foreign bodies simulating tuberculosis, and I have a photograph kindly taken for me by Mr. Lyster of an interesting case of gold-miner's fibrosis and (?) tuberculosis, which I will show to-night.

(b) X-rays are of much value, taken at certain intervals, in recording advance or retrogression of lesions under treatment, and especially institutional treatment; great caution, however, is necessary in distinguishing fibrosis radiating from improving lesions from advance of disease. They are also of value in defining the outlines of empyemata, of large cavities in which operative treatment might be suggested, perhaps also in detecting pulmonary aneurysms within cavities, in the recognition of pneumothorax, and as a guide in the inducement of pneumothorax in treatment.

(c) Some deep lesions can be detected by X-rays which are obscure to auscultation.

These conditions are quite recognizable by physical examination, but can be better defined and recorded by photography. It must be finally borne in mind that for the present at least, and for a long time to come, X-ray examinations—which are reliable—are the privilege of hospital patients, and the wealthy or those who are within touch of central institutions. They are luxuries to the people, but form an essential part of the scientific equipment of schools of medicine.

THE X-RAY EVIDENCES OF EARLY PULMONARY TUBERCULOSIS IN YOUNG CHILDREN.

By W. J. S. BYTHELL, M.D.

I PROPOSE to give you this evening a condensed account of a series of X-ray observations, including between 300 and 400 cases, which I have carried out during the last eighteen months with a view to determining the value of the rays in the early diagnosis of pulmonary tuberculosis in young children. The majority of these examinations have been made in the X-ray Department of the Manchester Children's Hospital in conjunction with my colleague, Dr. C. Paget Lapage.

The two points to which I have paid special attention are (1) the comparative reliability of the radiographic and clinical methods of early diagnosis, and (2) the seat of origin of pulmonary tuberculosis in young children. With these objects in view, Dr. Lapage has picked out for me children aged from 4 to 12 (mostly from 6 to 10), all of whom have come from the poorer quarters of Manchester and Salford. In something like 45 per cent. of these cases the physical signs were either absent altogether or indefinite, the suspicion or probability of pulmonary tuberculosis being suggested by the presence of cough, or of general symptoms, such as anæmia, debility, loss of weight, &c. In about 28 per cent. definite physical signs of early disease were noted prior to the X-ray examination, while the remaining 27 per cent. were selected as having in all probability as healthy chests as could be found among children of of the poorer classes of a big town like Manchester.

Dr. Lapage was present at the X-ray examinations of all his cases, but did not show me his clinical notes until the X-ray diagnosis had been arrived at. We were able in this way to compare the results obtained independently by the two methods, and to form some idea of their relative value. As regards the *methods of examination* employed, nearly

all the examinations were made by the fluorescent screen, plates being used only when required to clear up a doubtful diagnosis. The most important information in these cases is certainly derived from the fluorescent screen, as one is able to study the movements of the ribs and diaphragm, and the lighting up of the lungs, and also to turn the patient into various positions in order to see clearly the roots of each lung in turn, the posterior mediastinum and so on.

Now there are four chief points to which attention has been directed before attempting to make a diagnosis :—

(1) *The Movements of the Ribs and Diaphragm.*—These movements should normally be free, not jerky in any way, and they should be equal, or nearly so, on the two sides. In the majority of cases of pulmonary tuberculosis, even in the early stages, there is definite limitation of these movements, especially of the diaphragm of one or both sides, a condition usually known as " Williams's sign," after the observer who first drew attention to its diagnostic value. I agree with the importance generally attached to it to this extent, that definite limitation or absence of the diaphragmatic movements, either of one or both sides, must be regarded with grave suspicion, but I am perfectly certain from my own experience that absence of such limitation by no means indicates immunity from pulmonary tuberculosis, or even that the disease is limited to the roots of the lungs.

(2) The *lungs* should be free of shadows, or mottling, due to consolidation. Their translucency to the rays should also increase equally throughout during deep inspiration—or, as we describe it, they should light up in a normal manner as they become distended with air.

(3) A very careful examination must be made of the *roots* of both lungs. The crux of the whole matter lies in the answer to the query, " What is the normal appearance of the roots ? " and I must confess that I am not quite satisfied yet upon this point. There are undoubtedly always some shadows at the roots of the lungs in the most perfectly healthy children, produced by the connective tissue, vessels and bronchi. These structures give rise to tree-like or branching shadows, radiating outwards from the roots, which in normal lungs are extremely faint and sketchy. The probability is that every attack of bronchitis adds a little to the density of these markings, and I have found a very definite increase in chronic bronchitis ; but, in the absence of mottling due to enlarged bronchial glands or pulmonary consolidation, such increase does not, in my opinion, justify a diagnosis of pulmonary tuberculosis. I am aware that Jordan regards any increase of these streaks as a proof of peri-

bronchial infiltration of the lungs. I shall have occasion, however, to refer to his views again at the conclusion of my paper. In the next place, the examination of the roots may reveal other shadows caused by the presence of either pulmonary consolidation or enlarged (that is to say, tubercular) glands at the hilus of one or both lungs. These shadows are in most cases readily seen when present, and are quite unlike the streaky markings which I have described as normally visible. When they are recognized beyond any possibility of doubt, a diagnosis of tubercular infection of the bronchial glands may be safely made, and the only other question to determine is whether the lesion is recent and active, or old and healed. An old tubercular gland which has undergone calcification is unmistakable owing to the density of its shadow and the sharply defined character of its outline ; a recent infection of the glands, on the contrary, produces blurred or " woolly-looking " shadows, and the more woolly-looking they are the more recent and active is the lesion. The same distinction also applies to the interpretation of pulmonary shadows due to consolidation, when the infection has extended beyond the lymphatic glands into the lung tissue itself.

(4) Lastly, the child has to be turned into the semilateral position so as to separate the shadow of the vertebral column from that of the heart and aorta, in order that we may obtain a clear view of the posterior mediastinum. Normally this should appear as a translucent space, and any obstruction to the rays will indicate the presence of enlarged mediastinal glands. My experience, however, has led me to the conclusion that enlargement of these glands is much less frequently observed than of the bronchial.

Such is the nature of the evidence which an X-ray examination places at our disposal in our attempt to arrive at an early diagnosis of pulmonary tuberculosis, and we have now to discuss the value of this evidence and the difficulties in the way of interpreting what we see upon the screen or plate.

I have already alluded to the difficulty of defining the appearance of a normal lung root, and I might raise the further question whether there *is* such a thing as a perfectly normal thorax, except in the very youngest infants. Such a chest would contain nothing in the way of lung shadows except the faint branching streaks at the roots representing the connective tissue, vessels and bronchi. Most of the children I have examined have been between the ages of 6 and 10, and even in children so young as this one rarely finds a perfectly normal thorax. Nearly all the cases have shown either an increase of the streaks which I have attributed to

chronic bronchial troubles, or they show in addition evidence of having at some time or other suffered from an intra-thoracic tubercular infection.

Dr. Lapage has kindly tabulated for me 150 of the cases which I have examined with him, and the results we have obtained work out as follows : —

Clinical examination				X-ray examination					
				Positive		Suspicious		Negative	
Positive	...	...	43	35	...	5	...	3	
Suspicious	...	...	67	38	...	16	...	13	
Negative	...	...	40	9	...	8	...	23	

Thus, while out of the cases diagnosed as positive upon clinical grounds 94 per cent. were diagnosed as positive or suspicious upon X-ray examination, out of the forty cases picked out by Dr. Lapage as free from any suspicion of pulmonary tuberculosis no less than 22 per cent. were shown by the rays to be definitely tubercular, and 20 per cent. presented appearances which were decidedly suspicious. In these cases there was not only an entire absence of physical signs, but they were carefully picked so as to exclude any in which the history raised the least suggestion of chest trouble of any description ; and yet, as you see, the X-ray examination showed that in children of this age and class only about 55 per cent. could be definitely stated to be free from pulmonary tuberculosis. I may add that the other cases I have examined, amounting to a little over 200, agree very closely with the series tabulated here.

I think we shall all agree that unless we were to live in glass cages, supplied with sterilized food and air, every one of us must be called upon to deal with tubercular infections at various times during life, while town-dwellers (and especially children of the poorer classes who live under insanitary conditions) probably receive big doses of tubercle bacilli at frequent intervals. Therefore we may take it that the vast majority of persons whom we must define as perfectly healthy contain certain scars received in the successful battles that they have fought against the invading bacilli, most commonly in the form of enlarged, or possibly calcareous, glands which will be seen upon the fluorescent screen as definite shadows at the roots of the lungs. The children I have examined have all, as I have said, come from the poorer quarters of Manchester and Salford, and my experience is that among this class of children the great majority after the age of 6 or 8 have one, two, or more shadows at the hilus of each lung. The minority, in whom there is no such evidence of enlarged bronchial glands, commonly present some increase of the normal streaky appearance at the roots, the result, I presume, of

bronchial troubles. We may assume, then, if my reading of these cases is correct, that a very large proportion of children at this age (or at any rate among the poorer classes of our large towns) possess enlarged bronchial glands or caseous nodules at the roots which contain active tubercle bacilli. It does not, however, follow from this that they are necessarily the subjects of active tubercular disease, and still less that they are suffering from any form of pulmonary disease. The focus is in most cases a closed one, and the usual course of events is that in time the bacilli die out, leaving a more or less completely calcified gland or nodule which will remain visible upon the screen as a dark and well-defined shadow at the root of the lung. Nevertheless, so long as the glands contain living bacilli they are a source of danger to the child, and may at any time lead to infection of the adjacent lung tissue.

To sum up, the three chief points of practical interest that, as a radiologist, I wish to bring before you and to emphasize this evening are these :—

(1) That in a very large proportion of children, and among the poorer town-dwellers in probably the actual majority, the bronchial glands are enlarged and contain active tubercle bacilli which may under certain circumstances give rise to pulmonary phthisis.

(2) That when the glands are in this condition, or when the infection is commencing to extend into the lungs, the lesions should be readily diagnosed by means of the fluorescent screen, whereas the most careful clinical examination will probably lead to indefinite, if not actually negative results. That is to say, there may be an entire absence of physical signs, and the general health may be such as to merely raise a slight suspicion of some tubercular infection, without any localizing symptoms.

(3) My experience has been that, in children at all events, pulmonary tuberculosis *invariably* starts at the roots of the lungs, as in the slide you see upon the screen.

Out of the 300 or 400 children which I have examined systematically for this purpose I have never seen a single case in which the disease had not obviously originated at the hilus of the lung, and I have yet to meet one in which the sole or even the primary lesion has been apical. I do not mean that when the apex of one of the lobes has been involved there is necessarily a visible track of diseased tissue all the way from the root to the apex, but that when there is a lesion at the apex there is in every case a far more advanced lesion at the root of the lung which has escaped detection by clinical methods of examination simply because

it has probably given rise to no physical signs by which its presence could be determined. Dr. Jordan, I believe, goes further than this, and says that most, if not all, cases of pulmonary tuberculosis commence at the roots of the lungs, that is to say, in adults as well as children. According to his view, the disease always spreads from the hilus in the form of a peribronchial infiltration until it reaches a region (such as the apex of one of the lobes) where the conditions are more favourable to rapid growth'; he therefore argues that what I have described as an increase of the normal streaky appearance visible at the roots of all lungs is a definite indication of tubercular infiltration, and he would condemn all cases in which this is recognized as the subject of tubercular infection. Personally, as I have said, I am convinced that the streaky shadows may be increased, in some cases at all events, by simple bronchitis or bronchiectasis, and I regard definite mottling and nodules at the roots of the lungs as the only reliable evidence of tuberculosis. When therefore I first read his papers I felt inclined to disagree strongly with him upon this point, but latterly it has occurred to me that possibly the disagreement is really due to a misunderstanding. I can best explain what I mean by the help of this somewhat crude diagram, and I shall be very pleased if Dr. Jordan will give us his views upon the subject during the evening. If, when he speaks of peribronchial infiltration, he means mottling following the course of the bronchi—i.e., a series of mottled shadows giving a general impression of streakiness radiating from the root of the lung, such as I have attempted to represent in this sketch—then I am entirely in accord with him in regarding that appearance as diagnostic of tuberculosis. But, apart from this type of shadow, one often sees a definite accentuation of the normal streaky shadows which I am convinced is the result of non-tubercular bronchial troubles, such as I have pictured in this diagram. That, if I am right, is a very important point to be kept in mind when we attempt to interpret these root shadows. In any case, there is much to be said in favour of the view that adult, as well as juvenile, phthisis commences at the hilus of the lungs, for I cannot recall having seen a single case of a purely apical phthisis even in an adult. Most of the cases I have seen have been of this type, in which there is no doubt as to the root origin of the disease.

If time had permitted I should like to have dealt with the problem already raised by Sir Douglas Powell of how the disease spreads from the hilus throughout the lungs, at first sight against the direction of the

lymph-stream. To put my views as concisely as I can, I believe (from my post-mortem experience) that the lung may become infected either by the direct spread of the tubercular foci from the breaking down of the caseous glands, or by the bacilli being carried backwards along the lymphatics by what is known as the *retro-impulsion* of the lymph, owing to the block that has taken place at the bronchial glands. Later, as the disease becomes more established, the apices may become infected either by this direct extension along the lymph-channels, or as independent foci by one of the other methods, such as autogenous blood infection, aspiration broncho-pneumonia, or by bronchial embolism of infective particles detached from an open lesion. In either event the practical point for us to remember is that the infection is derived from the hilus, and that it is in this region that we must look for the earliest evidence of tubercular infection.

X-RAYS IN THE EARLY DIAGNOSIS OF PULMONARY TUBERCULOSIS.

By Stanley Melville, M.D.

Up to quite recent times I think the attitude of the clinician towards radiography may be fairly summed up in the following sentence taken from a well-known text-book : " In the early diagnosis of phthisis we have found the method of but little use." These are plain words and from men entitled to respect, not only because of their attainments and profundity of knowledge, but because they are open-minded men and fair in their judgment. I do not wish to dwell unduly upon this criticism, but I make bold to say that we may look forward with some confidence to a revision of this sentence in the next edition.

Radiography of the chest, I have no hesitation in saying, must ever be the handmaid, and not the ruler. To divorce the radiographic and clinical examinations, or to make them independent of one another, will be a calamity. But I maintain with all the emphasis I can, that the clinician of the future should not feel satisfied until his findings have been either fortified, or modified, by X-ray examination. I suppose, as radiographers, one of our greatest dangers is that of reading more into a skiagram than is actually present—perhaps I ought to say in regarding radiography as diagnostic rather than confirmatory and critical. For example, as to whether a tubercular focus in the lung

is active or inactive; the somewhat "woolly" appearance of the one, and the "harder" appearance of the other, are not in themselves sufficient and must be taken in conjunction with other evidence, both clinical and rational.

It is well, I think, to inquire as to what progress we have lately made in our knowledge of the X-ray appearances in the early stages of pulmonary tuberculosis. Chiefly, I imagine, in the great improvement in apparatus and technique (about which I should like to say a word presently), and resulting therefrom, our interpretation has, unquestionably, become more definite and exact. And yet, when looking up the literature on this subject, what a debt we owe to those earlier workers for the excellent foundation they laid. Who does not read with admiration Walsham and Orton's work on radiography of the chest? It is a small volume—but brimful of valuable work—with a bibliography long enough to cause mental vertigo. To this foundation we have lately been adding experience, and the first conundrum I venture to ask is this—viz., What are we to regard as a typically normal chest? Is it such a chest as the one I show you on the screen, one with the appearance of which you are all familiar? But, gentlemen, I examined a very great number of chests before I found this specimen, and I had begun to think it was a little joke played by Walsham and Orton on our guileless selves. Or, is the chest of everyday life, such as we meet with among town-dwellers at any rate, to be taken as a standard? The appearances of such a chest are very different, and opaque masses at the hilum with definite radiating striæ thence towards apex and base, are so common as to compel one either to regard them as within the limits of health or to consider them as arrested pulmonary tuberculosis, and accept the view that an overwhelming percentage of the population are, or have been, tubercular. I hope to get the answer to my conundrum to-night.

But, gentlemen, as the clinician recognizes a general type of chest which is prima facie suggestive of tuberculosis, so I think it possible for us to do the same. A chest, in which expansion is generally restricted; in which the cardiac shadow appears to be of small size and vertically placed; in which there may be restricted movement of the diaphragm; in which there may be, generally or locally, a suggestion of diminished translucency on deep inspiration, and in which are frequently seen opacities of varying density at the hilum on *both* sides—this is the picture I draw for your consideration. Let us examine such a type of chest a little more in detail :—

First : Deficient movement of the chest wall and diaphragm. If any further evidence were required to convince me of the necessity for taking X-ray evidence in conjunction with the clinical history and physical signs—it would be at this part of the examination. Practically any and every inflammatory process, whether of lung or pleura, will limit the excursion of the ribs and diaphragm on the affected side. And what a pitfall, for example, is an apical pneumonia, for here we have not only restricted movement, but actual shadows (perhaps finely mottled) in the lung tissue itself. But, undoubtedly, unilateral limitation of the diaphragm is a sign of very great value. I need hardly mention that careful comparison should be made between the movements of the diaphragm on the two sides. A bilateral limitation is frequently observed in nervous patients; in mouth-breathers, and in otherwise quite healthy persons, especially women, who normally make very little use of the diaphragm. Cog-wheel, jerky (or to use the most useful word, suggested I think by Dr. Bythell and Dr. Barclay— viz., " stammering ") movements are evidences of definite value.

Secondly : The Heart. While not wishing to dogmatize, I am convinced that the frequently noted, small and vertically disposed heart is a factor of the greatest importance. For my part, I have not found this condition restricted to persons with long and narrow chests, nor do I think there is justification for regarding it as due to rotation. The apex of the heart is usually well within the mid-clavicular line, and the right border is not abnormally situated. I regard it as a true dystrophy, and I venture to maintain that this small and usually feebly acting heart (whatever its size in later stages of the disease may become) is a definite factor in regard to prognosis.

Thirdly : The Mediastinum. The lymphatics of the lung (which, in the more superficial parts, communicate freely with those of the visceral pleura), together with the deeper lymphatics of the lung and bronchi, finally drain into the glands of the mediastinum, the bronchial and posterior mediastinal glands respectively. Further, there is free communication between the lymphatics of the pleura and peritoneum. The mediastinal glands may thus become involved through the mesentery —possibly a point of importance in considering the incidence of tuberculosis of the lung, especially in children. How much more common it is, in children, to find enlarged glands at the hilum, and the first evidence of pulmonary tuberculosis in the more central part of the lung rather than at the apices; indeed, how often does one ever see or hear of an apical tuberculosis in a child ? Are these enlarged glands
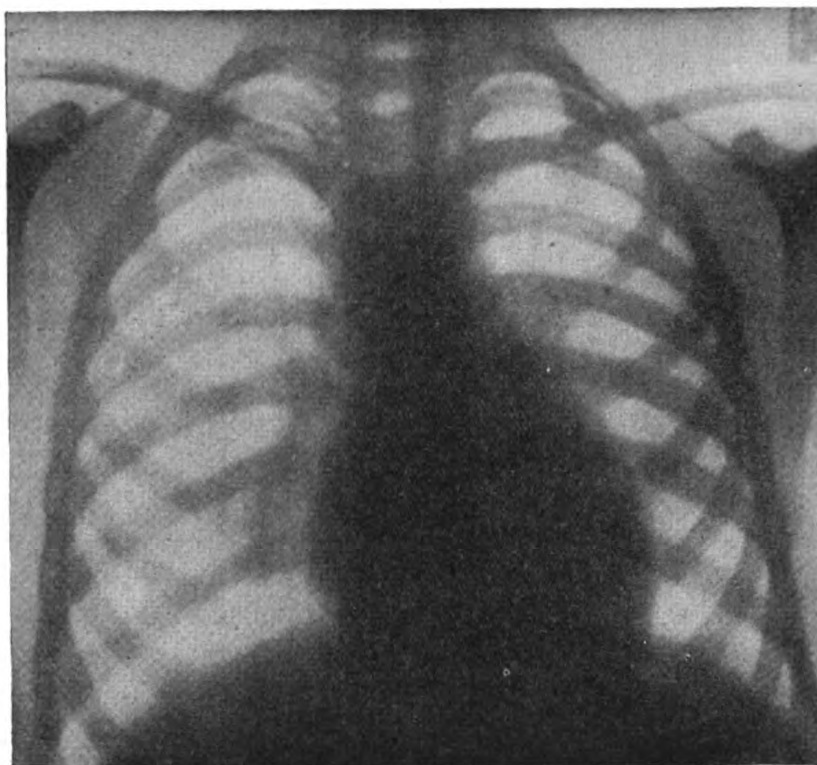
FIG. 1.

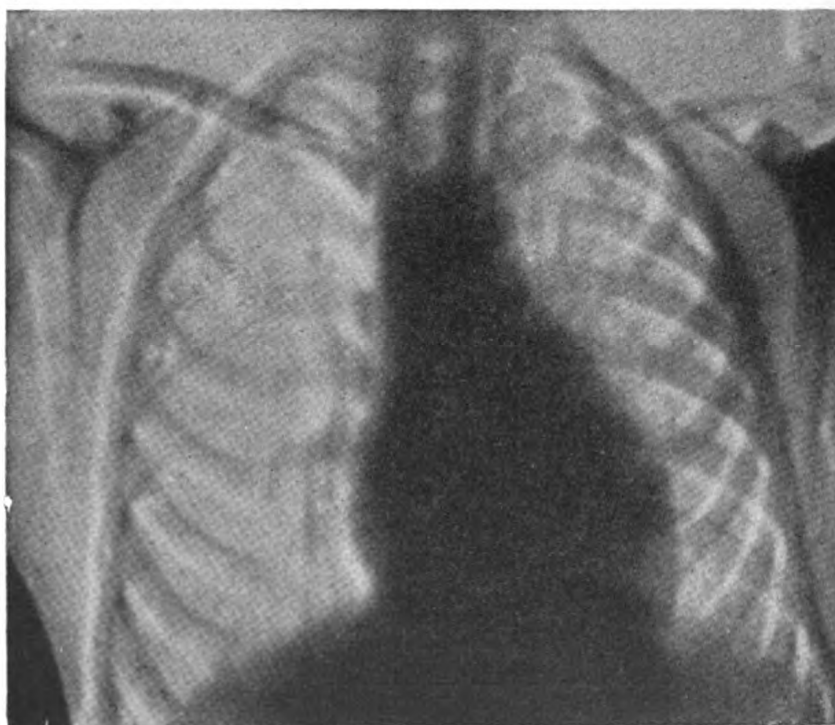Skiagram of normal chest—ordinary method.

FIG. 2.

Skiagram of normal chest—plastic method.

Fig. 3.

Skiagram showing characteristic mottling of centrally situated infiltration, from a case in which there were indefinite physical signs—ordinary method.

Fig. 4.

The same—plastic method.

at the root of the lung of mesenteric origin, and, if so, are they due to infection by bovine or human tubercle bacillus ? If so, what is the definite relationship between them ? Does the tubercle bacillus lie dormant in the glandular structures until aroused to activity by some exanthem or severe cold ? Will further research show that these enlarged and possibly caseating glands at the roots of the lungs are the result of a primary pulmonary infection, and that in late life a secondary infection is superadded. These are questions of vital importance, and I venture to suggest require further investigation.

The question of the significance of the radiating linear shadows seen in a large proportion of chests examined has received much attention, and is still, in its relation to pulmonary tuberculosis, *sub judice.* These radiating lines can be seen whenever the expansion of the lung is restricted either by disease or on holding the breath, and, by contrast, show up very clearly in emphysematous conditions of the lung. They are, I think, undoubtedly shadows of the bronchial tubes, though they are still held by some to be shadows of pulmonary blood-vessels. I would suggest that they are coarser shadows than would be cast by blood-vessels, and I show you a beautifully injected sheep's lung which Dr. Cecil Clarke very kindly prepared for me. In this the one lung is injected through the bronchus, the other through the pulmonary artery, and the contrast in density of the shadows is well shown. Taken by themselves I must admit to feeling somewhat chary about regarding these radiating linear opacities as pathogno-monic of tuberculosis—and only in conjunction with definite surrounding mottling should they, so far as my own experience teaches me, be so regarded.

Without being unduly critical, I must admit I do not like the term " peribronchial " phthisis. Am I wrong in suggesting that the term is not an absolutely sound one? Why not call it a " central " tuberculosis, in contradistinction to " apical " or " basal," any fibrosis around the bronchi being only the natural result of local irritation. The tubercle bacillus, either by aspiration, or more rarely by the blood-stream, finds its way to a fine bronchus or alveolus, and there develops, producing, by proliferation from the cells of the bronchi, alveoli and capillaries, a small mass of epithelioid cells. Extension then takes place by aspiration or by means of lymphatics. The fibrous stroma of the lung as the result of inflammatory irritation partakes of the nature of " growth under irritation " (I quote from Powell and Hartley), producing fibrosis of the lung. There is nothing un-

reasonable in the contention of radiographers that the tubercle bacillus will find a suitable locality in the more central portions of the lung—thence extending to the apex either by aspiration or by the lymphatics, or possibly by the blood-stream, and the slides which I show you illustrate this primary central invasion, at any rate, to my own satisfaction.

In the foregoing remarks I have in mind the recent work of Dr. Jordan—a work which I gladly join with other chest radiographers in welcoming. But, if Dr. Jordan will forgive my criticism, I am in some difficulty, if I have read him aright, in following his argument in its entirety. He appears to make several distinct propositions. Firstly, that opaque masses at the hilum, plus radiating linear opacities, are pathognomonic of a hilum invasion; secondly, that this condition, plus mottling, indicates activity. I am only in cordial agreement with him on this second proposition. Then I have another bone to pick with him—and this is when he becomes Napoleonic, and sweeps away difficulties as though they had no existence. I refer in particular to his dismissal of bronchiectasis. He writes: "It seems certain that bronchiectasis is merely a special form of fibroid phthisis in which the air-tubes have become dilated and putrefactive organisms have gained entrance." If Dr. Jordan is correct he will deserve our warmest thanks, and pathology will have to be re-written.

But, gentlemen, however suspicious we may be of the invasion of the lung by our examination, the one and absolute evidence is the presence in part or parts of the lung of the characteristic fine mottling. There are definite pitfalls for the unwary in the interpretation of this, but time will not admit of discussing them now.

It may be due to my own want of observation, but I have never been able to satisfy myself with making an examination with the fluorescent screen alone. I think it imperative to make this examination most thoroughly, and a vertical and horizontal diaphragm ought to be arranged on the screening apparatus to enable examination of a small area of lung, and the screen examination should, if possible, be made with the patient in the erect position. I, invariably, fortify my screen examination with a skiagram, and fine mottling of the lung, which can readily be overlooked with the screen, will be clearly demonstrated on the plate.

With the modern apparatus at our disposal and the possibility of passing heavy currents through our tube, instantaneous, or, at any rate, nearly instantaneous skiagrams should be the rule. For some time I have been in the habit of making plastic skiagrams, some of which I

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have brought for your opinion and criticism as to their possible value. They would appear to show the characteristic mottling well.

I have, personally, too slight an experience of stereoscopic radiography of the chest to speak with any assurance as to its value in pulmonary tuberculosis. It is certainly most beautiful and instructive, but whether of material use (having regard further to the expense and trouble involved) in the diagnosis of early pulmonary tuberculosis, I will leave others with greater experience to speak. My chief objection is that it cannot well be of daily routine use; somewhat complicated apparatus is required to do it efficiently, and the slightest movement of the patient during the exposure of the two plates is detrimental. These, however, are only working objections.

Gentlemen, I have to thank you for your kind patience with me. I should like, in conclusion, to make a confession of my own personal belief. I think—

(*a*) That we are behind other countries in the routine use of radiography as an aid to the early diagnosis of pulmonary tuberculosis.

(*b*) That radiography affords the earliest evidence of pulmonary tuberculosis, and, incidentally, demonstrates a more widespread extent of infiltration than is suspected by clinical examination alone.

(*c*) That a very high percentage of cases of pulmonary tuberculosis begin by invasion of the more central parts of the lung than at the apex —this especially noticeable in children.

(*d*) That clinical examination alone, even in the hands of the most experienced clinician, fails: (1) In the presence of emphysema, (2) in deep-seated invasions; and that these very factors, which hinder diagnosis by percussion and auscultation, are, for obvious reasons, the very factors which are an aid in X-ray examinations.

Dr. DAVID LEES, in answer to the President's invitation, said he had had no intention of joining in the discussion; he came simply to learn, for he felt sure he would hear and see a great deal from which he would derive instruction; and he would have been glad to postpone any comments until he had heard the X-ray experts. He had felt much interest in the subject during the last few years; and Dr. Simmons would remember that seven years ago they made some observations together in the X-ray room at St. Mary's Hospital, to determine how far physical examination on the one hand and X-rays on the other would agree, and how far they would differ, and whether one was better than the other. At that time their conclusion was that the X-rays would not definitely

show areas of apical dullness, which to his percussion were quite evident. Thus he felt at that time that the ordinary physical examination was more to be trusted than the X-ray examination. But even then he had a feeling that this conclusion would before long be altered, owing to the improvements in technique which were sure to come. And so it had proved. During the last few months, owing to the kindness of Dr. Orton, he had had the opportunity of testing the matter again, for Dr. Orton allowed him to send to his house a certain number of patients in whom he (Dr. Lees) detected what he considered definite evidence of incipient pulmonary tuberculosis, chiefly percussion evidence. He believed that the value of accurate percussion in the detection of incipient tuberculosis was much underestimated. In books and articles, stress was almost invariably laid on auscultatory signs, and, but very little upon changes in percussion. Indeed, the statement was sometimes made that auscultatory signs might be present when there were no percussion signs at all. He believed that to be an absolute mistake, and until this was recognized it would not be appreciated how very important in the diagnosis of incipient tuberculosis was the practice of methodical percussion. He would even say that it would not be recognized until physicians gave up the habit of examining patients in the erect posture only. For a proper examination of the front of the chest, it was absolutely necessary for the patient to lie on a couch with relaxed muscles.

Having examined cases of what he regarded as early pulmonary tuberculosis, he sent them to Dr. Orton's house, and Dr. Orton kindly investigated them by means of the X-rays. The joint conclusion was, that in every case in which percussion gave reason to believe in the existence of incipient pulmonary tuberculosis, the rays showed definite and distinct signs. So the improvements in technique had brought about a great advance in the applicability of X-rays to the diagnosis of pulmonary tubercle. But a fact which could not be too carefully noted was that X-rays would show certain deep-lying structures (to which in this discussion attention had already been directed), old damaged glands, and thickened bronchial tubes, which, in many cases, were no doubt the result of former attacks of tubercle, and in some other cases may have been simply due to attacks of bronchitis and similar conditions. As Sir Douglas Powell had pointed out, the bronchial glands were the dustbins of the bronchial tubes. The detection of such altered glands and bronchi did not prove that the patient was now suffering from active tubercle, and so it was easy to draw erroneous conclusions. He differed

absolutely from the statement which had been made during the discussion, that in the majority of cases, in children at all events, the disease *started* in the bronchial glands.   How did the disease-material get to those glands?   It was known that a large number of children, examined post mortem, were found to have caseous bronchial glands, but no other sign of tubercle in their lungs.   He believed the bacilli got there through the bronchial mucous membrane, sometimes without leaving any trace of their passage.   Apparently the same thing might happen in the abdomen.   Some patients were found post mortem to have very slightly affected mesenteric glands, yet the whole peritoneum was swarming with tubercles; the bacilli seemed to pass through the intestinal wall as easily as through the wall of the bronchial tubes. Even if a screen examination showed only disease of bronchial glands, that did not prove that the disease commenced there, but only that it was there the bacilli were arrested.   In cases of caseous glands in children, the infection was often of quite a virulent nature, and the tubercles spread locally by direct contiguity into the lungs, and sometimes by rupture of a softened tuberculous gland into a bronchus.   But both in adults and in children the *original sites of infection* in the lungs could be detected by careful percussion, though the auscultatory signs might be extremely slight.   The early infiltrations detected by percussion are difficult to see by a mere screen examination, but they may be quite evident in the skiagram, which shows areas of fine mottling, chiefly in the apical regions, but often also elsewhere.   The X-ray examination by Dr. Orton of the cases sent to him (1) confirmed in every case the existence of morbid changes in the lungs; (2) confirmed the statement, based on percussion, as to which lung was the more affected ; (3) confirmed the localization in the upper intercostal spaces; (4) revealed opaque root-areas and thickened bronchial tubes.   One case was of special interest, for by percussion it was determined that the left apex was more affected than the right, but with the fluorescent screen the right seemed the more involved.   But when the skiagram was taken, it was found to agree with the percussion signs.

He thought X-rays were likely to be of very great service in the detection of early pulmonary tuberculosis, and yet they were not indispensable, for the same facts could be determined by careful percussion.   But if a practitioner was not accustomed to rely upon his percussion, he would do wisely to obtain an X-ray picture of the case. But it must be taken by an expert with the best possible technique, and must be carefully interpreted, for, as Sir Douglas Powell had pointed out, these pictures were liable to great misinterpretation.

He thought physicians were much indebted to X-rays for demonstrating the fact of inhibition of the diaphragm. That was not invariable, but it was very frequent and very important, and it clearly pointed to an inhibition through the nervous system, similar to that which existed in peritonitis (even localized). He thought Dr. Bythell said that he had noticed the same thing in regard to the ribs. This inhibition explained a phenomenon which every physician must have noticed in cases of phthisis—namely, the very great difficulty of getting the patient to take a deep breath; one might persuade and even command him to take a deep breath, but scarcely any air entered, and it seemed certain that the muscles of inspiration generally were inhibited, as the diaphragm could be seen to be in an X-ray examination.

Dr. A. C. JORDAN said Sir Richard Douglas Powell had been good enough to warn him that he would refer to his (Dr. Jordan's) work, and he wished to thank him for his kindly criticism. Sir Richard, and some others, doubted his statement as to the frequency with which peribronchial pulmonary tuberculosis occurred. He had with him a series of X-ray photographs showing the distribution of the pulmonary disease in thirteen consecutive cases of phthisis examined in one week at the Royal Chest Hospital. (Dr. Lees was kind enough to show this series recently after his lecture at the Royal College of Physicians.) The thirteen cases included examples of phthisis in all stages, and every one showed considerable peribronchial mottling. In some the mottling was exclusively of the peribronchial type; in others the apices, too, were involved. Nor was this an exceptional week. The peribronchial mottling would be found to be the most prominent feature of the phthisis cases at any visit to the hospital.

With regard to the " normal hilus shadows," Sir Richard Douglas Powell had insisted, very properly, that the real proof that these shadows were the result of tubercle would be the demonstration of tubercle bacilli in them. But one would not expect to find tubercle in healed lesions ; nobody had ventured to doubt that the calcareous deposits found with great frequency in the bronchial glands of healthy persons were due to healed tubercle. Of course, these glands had other bacteria to deal with than tubercle bacilli ; still tubercle was the chief cause of chronic affections involving these glands.

Sir Richard Douglas Powell and others had quoted him as believing that pulmonary tuberculosis began in the glands at the roots of the lungs. This is a belief which he never held. It would be as rational

to argue that a patient with a tuberculous finger and tuberculous glands in the axilla had derived the disease in his finger from infection from the axillary glands. Of course the glandular involvement at the roots was a secondary change. The first stage was catarrh of the air-tubes; this gave no X-ray evidence of its existence. The next stage was catarrhal broncho-pneumonia; in this stage the lumen of the air-tubes was found to contain catarrhal cells (epithelioid plates), while the tissue surrounding the bronchial cartilages was found infiltrated with leucocytes. This peribronchial small cell infiltration gave rise to the X-ray mottling along the air-tubes which was the characteristic feature of peribronchial phthisis. The glandular enlargement at the roots then followed naturally, and was usually an early result.

In all other respects he was glad to find Dr. Bythell in agreement with himself, the only point of disagreement being in reality one of misunderstanding, for Dr. Bythell had quoted him as stating that the linear shadows always seen radiating from the roots were evidence of active disease, whereas he (the speaker) stated explicitly in his papers that the linear shadows might radiate even to periphery of the chest in healthy persons, but that mottling was the evidence of active disease.

Sir Richard Douglas Powell had objected to the statement, "The X-rays findings are facts"; he said, "No, they are shadows." True, but if the shadows can be proved to represent facts, they can be regarded as facts. In his second paper on the subject he had published an X-ray photograph in which he had marked five particular blotches of tuberculous broncho-pneumonia with the five letters, *a, b, c, d, e,* and below was a microscopical section through the entire lung of the same patient after death, with the same five blotches marked by the same letters, so that the identity of the five shadows with the five spots of tuberculous broncho-pneumonia was proved, at any rate, in this instance.

[Sir Richard Douglas Powell interposed to say he did not question the facts, but their interpretation.]

Dr. Jordan continued that the only way to settle the question was by making careful pathological and histological examinations of cases whenever the opportunity arose. In the case mentioned he had done so. Unfortunately, it was very rare for a chance to occur of making a pathological examination of a case of peribronchial phthisis while it was in a typical stage. As a rule, the disease had advanced far beyond that stage when the patient died, the greater part of both

lungs being destroyed. In the case in which he had been able to compare the X-ray pictures with the pathological changes the girl had died of tuberculous ulceration of the intestines before the disease of the lungs had advanced beyond recognition.

The only other chance of obtaining a full examination of a typical case must offer itself by a sheer coincidence, for instance, if a patient were to be killed by an accident after the X-ray examination.

(Slides were shown illustrating the various points mentioned.)

Dr. PASTEUR said it had not been his intention to participate in the discussion, but views had been advanced which, to him, were somewhat bewildering. Physicians were being asked to reverse opinions they had long held as to the direction of spread of tubercular lesions in the lungs, and to believe that tuberculosis always began at the root of the lungs and spread outwards. One speaker mentioned the manner in which he considered the spread took place. The extension of tubercular lesions in the lungs, both on clinical and pathological grounds, was believed to follow a more or less definite course from the apex downwards, and he failed to see how that order of events could present itself so often if the commencement of the disease was usually at the root. He agreed that tuberculosis in children was often located near the root, and he recalled vividly a case of suddenly fatal hæmorrhage from hæmoptysis in a child aged 4 ; it was from a large branch of the pulmonary artery, which was in communication with a cavity that had formed at the root of the lung, by direct extension from a tuberculous gland. But such cases did not establish the general proposition which had been advanced. One must admit that much of this evidence was based on the interpretation of shadows which had been observed in the chests of living individuals, many of whom were in good health. Before opinions which were firmly established could be reversed, it was necessary that the views which were to supplant them should be supported by the very strongest evidence ; and he agreed with Dr. Jordan that what was chiefly required was a closer correlation of radiographic evidence with post-mortem findings. Until that evidence was forthcoming he hesitated to change his faith.

Dr. BYTHELL, in reply, said that he had brought the subject forward not because he felt he had something very new to say, but because he considered it to be a subject which needed ventilating. He agreed that in some cases the first change was one of broncho-pneumonia, but in

most cases the disease of lung was due to the breaking down of tubercular glands. As Osler and Murray Leslie said, in some cases one cut a section of these lungs, and it was very difficult to tell where the gland ended and the broncho-pneumonia began. He had looked up sections of his own, and found himself in agreement with that idea. It was well known that a large number of children had tubercle bacilli in their glands, though apparently the children were in the best of health. There was a danger-spot there, and some day they might caseate, as the result of measles, or whooping-cough, and the bacilli get the upper hand. Many cases originated at the root through this. Dr. Lapage and he now proposed to proceed in the following way: To screen a dead body and make a diagnosis, then make the post-mortem examination, and see if the two diagnoses agreed. He would like to answer Dr. Lees's remark that he did not believe in the origin of the disease in the bronchial glands. He agreed that these glands were usually inactive, but Dr. Lees said enlarged bronchial glands, as seen by the screen, did not indicate active tubercular disease. Of course, in most cases the glands were able to deal with the bacilli; probably nine-tenths of those present at the meeting had done so, and showed scars resulting from the conflict. In others the glands broke down and infected the lung; it did not matter where the bacilli came from, because the practical point was that the first morbid lesion was the enlarged bronchial glands, which in turn infected the root of the lung. He took mottling due to pulmonary consolidation as the sole reliable evidence of active pulmonary tuberculosis, and he was sure, if he could get Dr. Lees to attend the out-patients' department at the Manchester Children's Hospital for a month, he could convince him of two things, as he had other medical men at the hospital whose feeling at first was the contrary: namely, first, that in children, at any rate, the disease invariably, in over 300 consecutive cases, started from the roots; secondly, that the rays showed definite pulmonary disease at the roots which could not be diagnosed by percussion or auscultation, or other method of examination. The root was the dangerous part.

Dr. Lees explained that his point was that although caseous glands were extremely frequent in small children, yet that the disease had not commenced there, but had got to the glands from somewhere, and in the overwhelming majority of cases he did not doubt it entered through the bronchial mucous membrane, sometimes without leaving traces of the passage.

(The discussion was adjourned until March 19).

Electro-Therapeutical Section.

March 19, 1913.

Dr. REGINALD MORTON, President of the Section, in the Chair.

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A Discussion on the Use of X-rays in the Diagnosis of Pulmonary Tuberculosis.[1]

SIR RICHARD DOUGLAS POWELL, in re-opening the discussion, said that in his opening remarks he endeavoured to define in what respects skilled X-ray examinations were most serviceable in the diagnosis of tuberculosis and laid some stress upon their value in recognizing the degree and extent of disease at different periods, thus serving to.record advance or retrogression under treatment, and especially under institutional treatment. In the diagnosis of the disease as regards degree, activity and outlook he would appeal to X-ray examination as of value in certain cases provided its findings were carefully collated with those of other methods and taken in association with the general features of the case. In cases of differential diagnosis, too, some of which he had specified, the rays were valuable, and also as a help in defining the outlines of pneumothorax or empyematous or other abscesses or cavities with a view to surgical interference.

He was unable to follow all the conclusions arrived at by Röntgen-ray observers with regard to the morbid anatomy and distribution and spread of lesions of tuberculosis, but on this point he spoke at some disadvantage, as he was not aware how far the conclusions of Dr. Jordan and others were generally accepted by their colleagues in the X-ray department of clinical medicine. It seemed to him a rash conclusion to accept the central opacities found in the great majority of cases examined as evidence of tuberculous disease, commencing at the hilus and the shadow streaks extending therefrom along the bronchial tracts as paths of advance of the tuberculous lesions towards the periphery.

[1] Adjourned from February 21.

A—8

One would expect all urban dwellers at least to have the shadows of their peribronchial glands deepened, and in this cigarette-smoking age the capacity of the glands as dust-sifters must be still more exercised. But the assumption of the X-ray specialists that these shadows were of tuberculous origin and that, as such, they preceded in most cases any peripheral lung lesion that could be recognized by other physical examination, was to his mind quite beyond what the facts warranted. Such an assumption received little support from pathological investigation, and excluding, perhaps, exceptional cases of mediastinal suppuration with inhalation of tuberculous pus into the bronchial tract, local infection extended along the lymphatics in the direction of, not against, the lymph currents.   It also seemed to him that in their clinical aspects the cases brought forward by Dr. Jordan as typically illustrative of his contention as to the central commencement of lesions and their extension towards the periphery were by no means conclusive.   In the case of the girl, aged 12, fig. 5 in the pamphlet, " Peribronchial Phthisis," the shadow over a large peripheral area P and the shadow over a corresponding peripheral area on the other side were nearly as deep as the central opacities and indicated the presence of physical signs of an obvious kind over portions of lung very commonly affected in an early stage of the disease.   There were similar shadows in fig. 3, the case of a man, aged 35, significant of lesions which could scarcely have been overlooked on careful physical examination.   It seemed to him impossible to regard these as lesions of extension from the central areas.

If X-ray examination revealed disease in all cases, where was the advantage of it ?   Like other clinicians, he had been accustomed these many years to give opinions for or against tuberculosis in cases which—occasional errors excepted—the views expressed had stood the test of time.   But, to put it in another way, supposing an X-ray department attached to a life assurance office.   It would be more easy for a camel to pass through the eye of a needle than for an insurance candidate to enter through that department to acceptance for first-class life assurance. And yet when statistics were examined it was found, for instance in Manchester, whence Dr. Bythell's statistics were derived, that the death-rate from all forms of tuberculosis was 9·8 of all causes and 0·16 on the population ; from pulmonary tuberculosis, 6·6 of all causes and 0·11 on population ; and in his own life assurance office, of 2,234 deaths in ten years 97 were from tuberculosis, or less than 5 per cent. of mortality. And of 150 cases in which policies had been issued in the last three years with a special clause that any person in whom tuberculosis had

arisen could at once claim two-thirds of the amount insured, in no instance had any claim come in.

Sir Richard repeated that he was not questioning the value of X-ray examinations in recording physical phenomena and in divulging some lesions that might be too deep for detection by percussion and auscultation, but to be of clinical value, beyond merely recording physical signs, such examinations must be made with the greatest caution and interpreted with the most rigid care.

He showed, by means of the epidiascope, skiagrams of two cases taken by Mr. Lyster, which presented clinical features of some interest. The first case was that of a man who came from South Africa, where he had been working in the gold mines; he had had what he called a slight attack of bronchitis, which, he said, was unattended with fever. From his description Sir Richard thought it might have been an attack of influenza. He stated that he was examined by five physicians in the neighbourhood of the mines, who all declared that he had tuberculosis, and that he must leave the mines at once. He was allowed considerable compensation on his discharge. The prognosis expressed was very grave and the patient came to England, and consulted him (the speaker). The physical signs were those of some emphysema and some degree of fibrosis, more marked at the left upper lobe than elsewhere. He had some tenacious mucous sputum, dark-coloured, but not amounting to "black spit." This had been examined once or twice in South Africa, but no tubercle bacilli were found in it. A further very careful examination was made in London, but still no tubercle bacilli were discovered. Mr. Lyster made an X-ray examination of him, which showed a certain amount of general fibrosis and pigmentation of the lung (figs. 1 and 2). Sir Richard regarded the shadows as indicating a certain degree of peribronchial and interlobular fibrosis with some deposition of silicious dust in the lymphatic tissues, and he interpreted the deeper central shadow as due to the pigmentation seen through the greatest depth of the lung, and to some enlargement and pigmentation of the bronchial glands. The other half of the skiagram showed the same thing. The symptom which attracted attention was a peculiar air-hunger; the man would from time to time give a deep sighing respiration, and complained that he could not "get to the bottom" of his breathing. He also suffered from occasional attacks of heart failure. He had had several such attacks on board ship, some in South Africa, and one on his way down. Finding nothing wrong with his heart, Sir Richard attributed these to a neurosis for

which, perhaps, the sudden shock from the announcement of the seriousness of his condition was responsible. He regarded the case as one of pneumo-koniosis in an early stage and had given a hopeful prognosis if the patient discontinued mining and lived a fresh-air life.
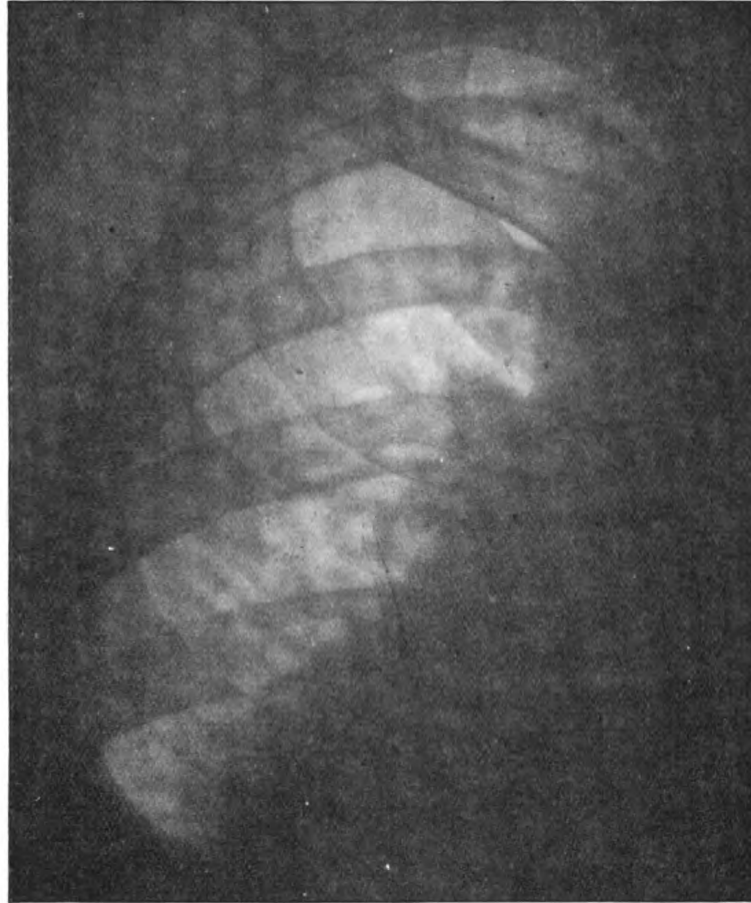
Fig. 1.

Case of pneumo-koniosis. Skiagram of left side, showing a general peribronchial and perilobular mottling of the lung with deeper central shadows partly interpreted as the general mottling seen through the thickness of the lung, with fibrous condensation and silicious dust deposition in the bronchial glands.

The next case was to him a conundrum, and if any member could throw light upon it he would be pleased. The patient was an estate agent, aged 35, who had had a cough every winter for some years. In May last he had influenza, and the cough had persisted ever since,

and was now very troublesome, and often attended with a choking, flatulent regurgitation, and he occasionally brought up clumps of blood. His weight had been maintained. He had occasional acidity. Up to a month ago he had been a free smoker, but there was no history of alcohol. Twelve months before he had had syphilis. The physical signs
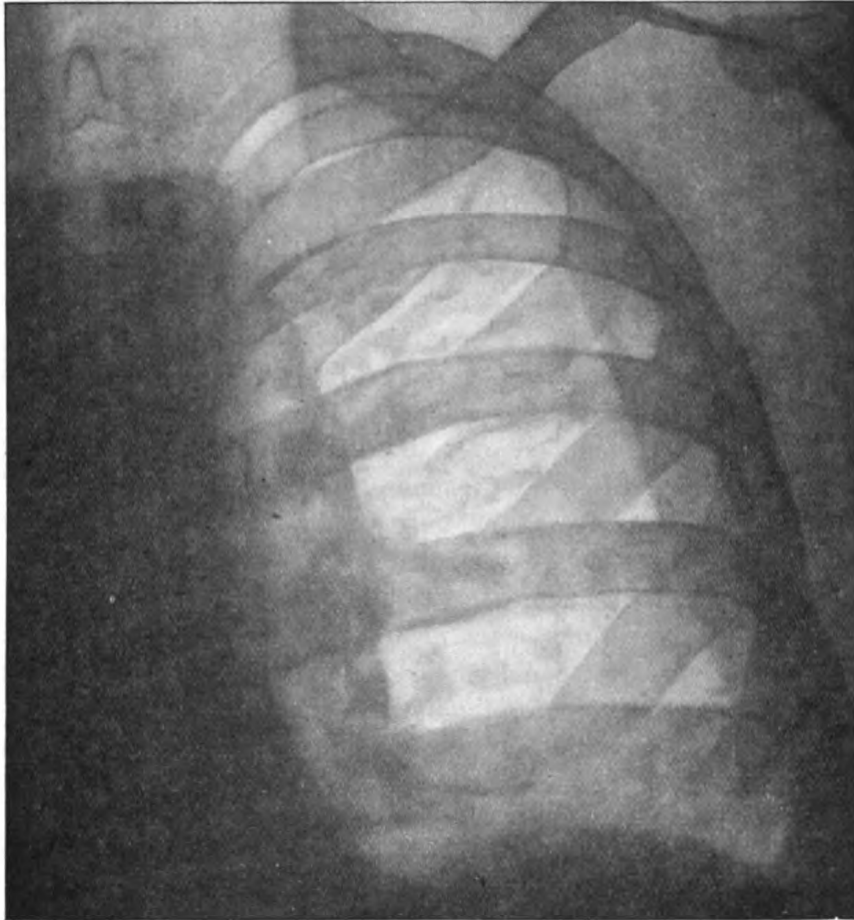
FIG. 2.

Skiagram of right side, from the same case, showing a less degree of the same condition.

were remarkable. There was dullness over the right front from the second space downwards, and inwards to within half an inch of the right margin of the sternum, the resonance of the left lung extending across the mediastinum to this line. The maximum impulse of the

heart was felt at the fourth intercostal space in the right anterior axillary line, but on careful palpation and auscultation the apex beat was made out to be at the fifth intercartilaginous space about half an inch from right margin of sternum. The liver dullness extended to within the margin of the cartilages and the liver could not be felt below. Posteriorly there was general dullness over the right side, the dullness being absolute from the midscapular level downwards, but the upper line of complete dullness was somewhat convex, the margin of lessened dullness extending a little downwards both in the interscapular and axillary regions. Over the region of complete dullness both respiratory and vocal fremitus were practically absent. The dimensions of the side were, however, not notably altered, but the movement was lessened. Above the complete dullness in the interscapular region below the spine of the scapula the breath-sound was imperfectly cavernous in quality, the voice pectoriloquous, and a few coarse crackles were heard with an occasional flatulent gurgle communicated from the œsophagus. In the supraspinous fossa and in front the respiratory sounds were somewhat blowing but weak. The resonance of the left side of the chest was full, and extended over the sternum to a little beyond its right margin. The respiratory sounds were coarsely vesicular. The stomach resonance was over the normal area. There was no abnormality notable about the heart except its position.

This man's mother and maternal uncle had died of phthisis. He had passed for life assurance after medical examination nine years ago, and up to eight years ago could bicycle 100 miles. There was no history of his having inhaled any foreign body nor of any pleuritic illness or attack suggestive of pneumothorax ; and Sir Richard was at a loss to account for the extraordinary degree of displacement of the heart, and could only suggest a densely fibroid lung with possible excavation at the apex of the lower lobe and a cartilaginous caseo-tuberculous pleura. The history pointing to these was, however, quite deficient, and he had learned the further interesting fact that as recently as September last the patient had consulted his colleague Dr. Young, who then found only a slight impairment of resonance at the right base, the position and sounds of the heart being normal.

The skiagram bore out generally the physical signs and showed the enlargement of the left lung and the complete displacement of the mediastinal contents to the right of the spinal column, also a remarkable corresponding divergence of the lower trachea and main bronchi to the right. It showed also that the case was not one of pleuritic

effusion and that no foreign body was impacted in the bronchus. Growth seemed to be excluded, and probably the case might ultimately prove to be one of tuberculous and, perhaps, loculated pleura with fibroid collapse of the lung. The history of syphilis was too recent for a gummatous explanation of the condition.

Mr. C. R. C. LYSTER said that, in regard to the case of miner's lung mentioned by Sir Richard Douglas Powell, it might be taken as a lesson from the radiographic standpoint. From what Sir Richard Powell said, he did not regard it as a case of tubercle, and yet the markings or mottling in the bronchi would be difficult to distinguish from those due to tubercle. He considered that in that case there was an actual deposit of earthy salts from the mine in the bronchi, causing an irritation fibrosis; and probably the deeper markings towards the hilum were due to enlarged glands, as the result of this chronic form of irritation.

He thought it right to give the result of his small experience on the question of diagnosing tuberculosis by X-ray plates and screens. He confessed he could not be certain that mottling in the bronchi was due to tubercular infection only. He had seen cases of small patchy bronchopneumonia in children suffering from whooping-cough, which he would read as identical with cases which had been shown and which he had been assured were tubercular. He hoped and believed a time would come when the X-ray plate would enable one to say which case was tubercular and which was not, but he did not think that time had yet arrived.

Dr. DAVID LEES desired to add a word or two to the remarks he made at the last meeting. He was grateful to Dr. Bythell for his invitation to visit his Manchester clinic, and regretted that he had not been able to accept it. But even if he had been able, he would have felt that a screen examination not reinforced or corrected by a skiagram was not absolutely trustworthy, and might lead to error of interpretation. By kind permission of Dr. Voelcker, Dr. Ironside Bruce and he had examined three cases at the Hospital for Sick Children, Great Ormond Street, in which he found percussion signs which seemed to him evidence of a present or past tuberculosis.

In the first case, on screen examination, there was some general increased opacity of the right lung, which was more definite and discrete

at the root, and extended towards apex and base. (No note about the left side.) Diaphragm movements equal, right diaphragm flattened.

Skiagram : Increased opacity of both lungs, made up of fine striations, the right lung being particularly involved. Throughout both lungs *small rounded opacities arranged in groups*, more numerous though less opaque and less sharply defined at the right base and apex.

In the second case percussion signs again showed an excess on the right side ; both sides were affected. Screen examination : Some general increased opacity of right lung, more marked towards the root ; extends towards base and apex—most marked towards apex in second interspace. The left root showed some increased opacity. Diaphragm movements normal and equal.

Skiagram : Both lungs showed opacity, most markedly the right, and towards both roots. The increased opacity was made up of coarse and fine striations, but was also due to *rounded opacities arranged in groups.* These latter abnormalities were more numerous throughout the right lung, particularly the right base, but were present also on the left, the apex being principally affected.

In the third case the physical signs were nearly equal on the two sides, but rather more on the right. On screen examination there was increased opacity of right root, extending more markedly towards the base, but also to some extent towards the apex. Left lung showed nothing abnormal. Limited movement of right side of diaphragm.

Skiagram : Both lungs showed a considerable degree of increased opacity, which was coarsely striated, but there were also fine striations. The whole right lung was involved, there being present, in addition to the striæ, *small rounded areas arranged in groups and distributed throughout the whole lung*, but most numerous at the base and at the level of the second interspace. On the left the increased opacity was made up of coarse striations, which occurred at the root and towards the apex. In the latter situation a *few rounded opacities* were present.

The question requiring to be settled was whether these groups of opacities, which came out so distinctly on the X-ray plate (though possibly not always on the screen), definitely meant tubercle, or whether they might be the sequelæ of bronchitis or other conditions. In his own experience, they corresponded to a percussion dullness which he regarded as characteristic of tubercle. That was a proposition which he did not wish anybody to accept on his authority; he hoped they would test it for themselves; it required testing by careful and accurate observation of many cases.

Dr. SYDNEY A. OWEN said he felt some diffidence in addressing this Section, because he knew only too little of the technique of radiography. Through the kindness of the President he had been asked to express his opinion, from the standpoint of the clinician, as to the value of X-rays in the early detection of tuberculosis of the lung. Personally, he laid great stress on the value of radiography in this connexion and employed it extensively in his clinical practice. This he was enabled to do through the kindness of his several colleagues. He would like to take this opportunity of thanking Dr. Morton, Dr. Hugh Walsham, Dr. Stewart, Dr. Salmond, and Dr. Hampson, not only for permission to show the plates, but also for the numerous occasions upon which they had assisted him. He thought the best way to attempt to convince others of the value of radiography in this connexion was to try to correlate, by graphic methods, symptoms and physical signs, as elicited by routine physical examination, with the appearances found in negatives. To do this he had prepared, and would throw on the screen, a card giving a summary of the symptoms, signs, and radiographic reports, and at the same time illuminate the corresponding negative. He had arranged a series of cases under four groups. In this series there was a gradual gradation, clinically, from cases with tubercle bacilli in the sputum, definite symptoms and signs (Group I), to cases where the signs and symptoms were very slight (Group IV). In Groups I, II, III, the negatives always showed definite changes; in some cases the disease, though the physical signs were slight, was found to be more advanced than clinical examination indicated. In every case in Group I the radiologist had independently confirmed the tentative clinical diagnosis prior to the detection of tubercle bacilli; in one case as long as three months. Inasmuch as the appearances in all negatives in Groups I, II, III, seemed to him to be identical in kind, differing only in degree and distribution, was it not permissible to assume that in those cases where tubercle bacilli were absent (Groups II, III) the radiographic examination afforded, if not confirmatory, at any rate strong presumptive evidence in favour of tuberculosis? He was quite prepared to admit that great caution was necessary in the correct interpretation of shadows in the region of the hilus, but the densities he wished to draw attention to, and upon which he himself laid great stress, could be seen high up in first and second spaces, and, in some cases, at the extreme apex of the lung. In those cases where the radiographic appearances were unilateral the contrast was most striking. In his opinion, whilst it might be very difficult to define the appearances

of a healthy hilus, the apical portions of the lung in health give a very definite picture. He would now throw upon the screen and illuminate the negatives referred to.

Group I comprised five cases (males—one, aged 16; females—four, aged 10, 27, 27, and 35). The evidence of tuberculosis was positive, tubercle bacilli having been found in the sputum. In addition there was a definite history of recent immediate contact from other members of the same family in three cases. All the patients had definite symptoms of lung disease—e.g., cough and expectoration. In three hæmoptysis occurred. In all the physical signs were slight but definite—e.g., slight percussion dullness, weak air entry, and in two cases a few fixed râles. In the face of evidence such as this he did not think these patients were mere tubercle carriers. In all the negatives showed very definite changes. In the case of the male patient, aged 16, a positive diagnosis of tuberculosis by the rays was made in April, but tubercle bacilli were first detected in the sputum in the following July. A second skiagram of this patient's chest, taken six months after the first, gave an almost identical picture. Surely this was good evidence that the densities seen on a plate, though merely shadows, were not due to mere accident. In all the other cases in this group, as already stated, a diagnosis of tuberculosis radiographically had been made by an independent person prior to the detection of bacilli in the expectoration.

Group II comprised three cases (all females, aged 11, 7, and 27). Tubercle bacilli had not, up to the present, been found in the sputum, but the speaker did not think there was any question as to the diagnosis of tuberculosis of the lungs being correct, because in the case of the child aged 11 (a) the mother had died recently of tuberculosis ; (b) the symptoms were definite—e.g., cough and wasting, but no expectoration ; (c) the physical signs in the lung were definite; (d) the temperature during six weeks ranged between normal and 100·6° F. ; and (e) recently the child had developed tuberculous irido-cyclitis, a diagnosis which had been made independently by an ophthalmic surgeon. The negative showed very definite apical mischief, especially on the right side where the physical signs were chiefly in evidence. In the case of the child aged 7, in addition to cough, hæmoptysis, and definite physical signs in the lung, there was a large breaking-down, tuberculous gland in the lower neck on the right side. There was some question, too, as to whether the child might not have tuberculous disease of the spine as well. The negative showed a definite lesion. The contrast with the other side was

very well marked. In the case of the patient aged 27, who had been under treatment for tuberculous irido-cyclitis since September, 1910, the physical signs in the lung were very slight. The sputum was negative for tubercle bacilli, and the von Pirquet's reaction was positive. A definite diagnosis of tuberculosis of the lungs was made radiographically by an independent person in April, 1912. The patient had her first hæmoptysis in March 1913.

Group III comprised nine cases (four males, aged 31, 28, 27, and 26; and five females, aged 27, 9, 11, 31, and 22). The proof of tuberculosis of the lungs, from the clinical side, rested upon (*a*) recent immediate exposure from one or several other members of the same family in six cases; (*b*) the presence of definite symptoms, such as cough and expectoration, in eight cases, hæmoptysis in three cases, pleurisy in one case, wasting in three cases, and continuous fever in one case ; (*c*) slight, though definite, signs at one or other apex of the lung. In all, the negatives showed definite changes.

Group IV comprised four cases (two males, aged 17 and 33; and two females, aged 35 and 23). The evidence in favour of tuberculosis was very slight from the clinical side, so far as symptoms and signs were concerned, but though slight they were very suspicious. In two cases the negatives showed appearances which, in the speaker's opinion, were indicative of very early mischief. In two the changes, radiographically, were so slight that a tentative diagnosis had been made.

Dr. N. S. FINZI: During the two evenings of this discussion we have heard a great deal about the interpretation of the shadows at the roots of the lungs but nothing of the technique of obtaining the skiagrams and its bearing upon the results. It is upon these subjects that I propose to say a few words.

Dr. Lees mentioned during the discussion the improvement in technique during the past five years, but what is it that has caused this change? I answer, most unhesitatingly, instantaneous radiography. Yes, gentlemen, instantaneous or snapshot radiography has absolutely revolutionized our results by giving us detail in the negative that no human eye could recognize on the fluorescent screen. Further, with still shorter exposure than we at present can give we shall get even better results, for we are a very long way from perfection in this branch of radiography. Next to instantaneous radiography, shortening of the exposure so as to skiagraph a patient while holding his breath was the most important advance effected, but for most of us this was many years ago.

I now show you three slides of skiagrams taken from the same case one after the other with the same tube. The first is a time exposure with the patient breathing quietly. Notice the blurring of the hilum shadows and the absence of any detail in the structure of the lungs even of the apices, which move comparatively little. The second is a time exposure with the patient holding his breath. Each of these was taken in ten seconds. In this second skiagram the hilum shadows are fairly clear, but details of lung structure leave much to be desired. The third was taken in a fraction of a second, and we now begin to see a clear picture of the hilum and details of the structure of the lungs—not enough of this latter, as the exposure is not short enough, being about a quarter of a second, though nominally one-tenth. The great point in this method is that heart movements are eliminated as well as respiratory movements. It is essential, however, to give a full exposure, as under-exposure in itself results in loss of detail, and provided the exposure be sufficient, softer tubes give better results than hard.

Lately, exposures have been made in times from one-eightieth to one-two-hundredth of a second by what is known as one-flash apparatus, but it is impossible by this method at present to obtain a satisfactorily exposed plate of an adult chest without using an intensifying screen. Now the modern intensifying screen gives very little grain, but the grain is sufficient to detract from a picture of the lungs, and I look forward to the time when we can get a powerful enough flash to give a well-exposed negative of the chest without any intensifying screen. Then, indeed, will no physician be able to ignore the value of this method of examination.

I show you two other slides, one of a normal chest showing how marked the peribronchial shadows may be, and another of a case of chronic bronchitis showing only an increase in density of the normal lung structure.

I regret that I have not had the opportunity to look out some plates of phthisis.

Now as to the scope of X-ray examination in phthisis. First of all I must emphasize the fact that a skiagram is only a physical sign, and though I believe it is a very valuable one, in fact, the most valuable one, still it is nothing more than a physical sign. It is only a link in the chain of evidence for or against the disease. As to whether X-rays can detect more than other physical signs it is very difficult to express an opinion. Personally, I believe they can, for in undoubted cases of phthisis it is usual for the skiagrams to show not only more than can

be detected by clinical methods, but more than can be inferred from them, especially in parts other than the apex. The demonstration of quiescent calcified nodules is of no value to the physician, and these must be carefully distinguished from active disease, and it is for us to train ourselves to do this. To show that 50 per cent. or more of healthy people are suffering or have suffered from phthisis is of no value in diagnosis. As to hilum shadows, when we consider what a quantity of dust and dirt the lymphatic glands in this region have to deal with, it is not surprising to find considerable shadows here, and we have no right to assume that they are tuberculous unless a definite tuberculous structure can be shown post mortem. Has it ever been proved that these deposits are calcareous and not silicious? Further, the demonstration of a shadow in one particular part neither proves that the disease began in this part or that this shadow represents the entire diseased area; more than this, it seems probable that in the early congestive stage of phthisis no shadows will be thrown, and it is only when caseation, fibrosis, or calcification begins that radiographic evidence is obtained. Fortunately, caseation is a very early change.

Another point I wish to deal with is the translucency so common in an apex undoubtedly affected, and several skiagrams were shown at the last meeting illustrating this. I consider that this is very. frequently due to a cavity at the apex, and often a careful examination of the skiagram will reveal this, and, in fact, I thought I could detect such cavities in some of the slides shown. In skiagrams a cavity is not a very striking thing, and it needs carefully searching for—it does not hit you in the eye. Some years ago I had the good fortune to radiograph a case of secondary sarcoma in the lungs, and the patient succumbed the next day. Before I saw the plates I had seen the lungs themselves, and there was a large cavity at each apex. Though I should previously have missed them, these were quite easy to distinguish in the plates, but the only change presented was an increased translucency and greater detail over an area which was sharply limited by a sudden change to a denser part with less lung structure visible. I have subsequently frequently been struck by the small amount of change which an apical cavity produces.

It might be thought that the examination of chests post mortem would help considerably, but as the examination in the living should always be made during deep inspiration, it must be borne in mind that it is equally necessary to inflate the lungs of the corpse.

Dr. R A. YOUNG wished only to make a few criticisms and ask questions. The subject was of great practical interest and importance, but he thought it must be approached from the clinical standpoint— i.e., as an applied method, rather than as an academic matter. He was somewhat disappointed at the last meeting, because he thought the results were too theoretically considered. The object of the meeting was the clinical evaluation of X-ray findings in intrathoracic tuberculous disease. The earliest possible diagnosis of such disease was the object for which physicians were striving in different ways. The outlook of many speakers at the last meeting seemed to him to be too academic. The determination of the sites of tuberculous deposit in the thorax was primarily a pathological question, and could only be settled by pathological research. That the earliest deposits, in most cases, were in the bronchial glands was not seriously disputed in the case of children. The relationship of these deposits to tubercle later in life was still a debated question. Was the apical deposit in adults a recrudescence of the old lesions, or was it a reinfection? He did not look to X-rays to decide this question, but to pathology. There was a danger that if too great stress were laid upon the X-ray appearances they might suffer the fate of some of the other clinical methods which had been applied to diagnosis and had showed too much; for example, the von Pirquet reaction, which was too delicate, except in young children, to be of practical value. It was necessary to know the exact significance of the chest shadows, especially those at the hilus of the lung. Post-mortem records, like those of Dr. Jordan and other observers, might show the frequency of old healed or arrested lesions in the bronchial glands, and even at the apex of the lung. There was nothing new in that; what was wanted was some further evidence that the disease spread from the hilus to the apex, in the way it had been said by Dr. Jordan to spread. It was probable that the spread took place by the lymphatics, and the name " peribronchial phthisis " did not appeal to him. He would certainly require further pathological evidence before accepting it. And he still felt he would distrust X-ray findings which were not definitely correlated with symptoms, or even with physical signs. He wished to ask whether X-rays could show a deposit in the bronchial glands of children before there was clinical evidence of such deposit? Secondly, could X-rays differentiate old healed, quiet lesions from recent, active, progressive ones, whether at apex, hilus, or base? Thirdly, was it clear yet how much of the X-ray appearances seen at the root of the lung were normal? And of those which were

pathological, were they due to old quiet lesions or to active tuberculous processes in the bronchial glands, or at the hilus of the lung ? Fourthly, accepting Dr. Jordan's statement as to the line of march, could the X-rays show progress from the hilum to the apex at an early stage, before there were recognizable physical signs ? And, if so, what were those X-ray indications ? Lastly, in basic conditions, which always seemed to cause most difficulty in diagnosis, would the X-rays give definite information in distinguishing between recent active infiltration, thickened pleura, bronchiectasis, and fibrosis ?

He considered such meetings as the present one were of very great value, because they enabled those who were looking at the subject from different standpoints to gain further information, and to appreciate different aspects of the problems they were investigating.

Dr. GILBERT SCOTT said most of the points he had intended to bring forward had already been dealt with by the previous speakers. He quite agreed with what had been said on the subject by Dr. Finzi and Dr. Young. What made the radiographic diagnosis so difficult in chest cases was the fact that the normal radiographic appearance was still undecided. Skiagrams taken of what were regarded as normal lungs would show wide ranges of difference. In the case of people who lived in changeable climates, the amount of inflammatory change remaining in the lungs must be considerable, leaving behind fibrous tissue in a more or less degree, with enlarged and calcareous glands at the roots of the lungs ; practically all those living in this climate had these conditions present. He did not think it justifiable that a person should be diagnosed as " tubercular " simply because this condition was present in his lung ; a condition which might be caused by simple inflammatory changes other than that carried by the tubercle bacillus. It was as well to remember that even the typical mottling of phthisis, which might be seen at the apex or elsewhere in the lung, might be produced by other conditions. He mentioned a case of a man, aged 60, who showed at one apex the typical mottling of early phthisis. He died soon afterwards, and at the post-mortem the appearance was found to have been caused by collapse of that portion of the lung, due to a malignant gland having pressed on a bronchus. This portion of the lung was adherent to the chest wall and there was no air entry.

Dr. R. MURRAY LESLIE said he would like to dwell briefly on one or two points which had emerged from the debate, particularly one or two

aspects of the question under discussion just brought out by Sir Richard Douglas Powell.   One of these had reference to statements by recent writers, including the speaker, that the large majority of all persons were the victims of tuberculous infection in early life, and if that were so, why it was that the death-rate from phthisis was not much higher than it was known to be.   It seemed to the speaker that this apparent contradiction was adequately explained by the observations of such investigators as Hamburger and Monti, of Vienna, who had found that although 94 per cent. of school children contracted the infection in some form before the age of 15, yet 80 per cent. of these never showed definite symptoms of disease.   This was, no doubt, due to a permanent cure of the tuberculous deposit at the hilus of the lung and elsewhere having taken place, and to the establishment of a gradually acquired immunity, which rendered the individual less liable to subsequent infection.   It would thus seem that the previous existence of old cured tuberculous foci at the hilus might be an actual advantage to the individual on account of the comparative immunity thus conferred.   With regard to the spread of the disease in the reverse direction to the course of the lymph-stream due to the "retro-impulsion of lymph," and fully described in the speaker's recent publication on "Hilus Tuberculosis,"[1] Sir Almroth Wright and others had shown that this could happen in the case of plague and other infections, and that this backward spread could be readily observed in the case of tuberculous cervical glands in children.   He agreed with Sir Richard Powell as to the difficulty of judging from an X-ray examination as to the direction in which the spread had occurred, whether from the hilus to the periphery or vice versa.   This could only be ascertained by carefully analysing a series of successive skiagrams of the same patient taken at certain intervals.   As Dr. Finzi pointed out, it was only during the last twelve months or so that instantaneous skiagrams had become possible ; the use of the instantaneous method, in conjunction with the recent improved technique, promised valuable results in the future.

As regards the X-ray findings, he agreed with Dr. Ironside Bruce and other radiographers as to the importance of the patient holding his breath during examination, as otherwise the clusters of tiny opacities which frequently indicated foci of tuberculous broncho-pneumonia did not stand out clear and defined, and there was only a blurred result difficult to interpret.   In the case of the shadows cast by hilus thickenings, he

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[1] *Clin. Journ.*, January 22, 1913, xli.

agreed it was difficult to state whether they *per se* were due to tuberculous or non-tuberculous fibrosis (i.e., silicosis and other conditions) ; he would point out, however, that even in the latter case it was difficult to exclude the co-existence of tubercle. When the appearances were limited to the root area the question could not be decided on X-ray evidence alone.

Dr. E. L. COLLIS said that in his work as a factory inspector he had gixen much attention to tuberculosis, and he had endeavoured to get a series of X-ray photographs taken of persons much exposed to dust. The first attempt was carried out by Dr. Rayner, but the patients were tuberculous, and it was impossible to say that the extended area of shadows was not due to tubercle. He then got Dr. Hallam, of Sheffield, to radiograph for him some grinders who were not tuberculous, but had silicosis, due to the inhalation of dust of uncombined silica. Tubercle in such individuals runs a rapid course, the patients may be dead in six months. These men were alive and well twelve months after the photographs were taken, and the only apparent abnormal symptom was a shortness of breath. Yet the plates showed shadows which those accustomed to interpret them considered to be typical of disseminated tuberculosis.

Dr. A. E. BARCLAY said he was far from convinced as to the prevalence of peribronchial phthisis. Since Dr. Jordan read his paper some time ago he had set himself to look at all the normal chests he encountered, including a good number of stomach cases, in whom, presumably, the lungs were healthy. He had examined some 400 cases, and the root shadows which had been described were present in practically every case. Many of them showed thickened and enlarged glands. He was quite sure they had not *all* got peribronchial phthisis. He would diagnose the presence of peribronchial phthisis only when he was convinced that these shadows were of active pathological significance. The only way in which one could arrive at this conclusion was by a comparison of instantaneous skiagrams, taken at intervals of a month or two. If this method showed *extension* of the root shadows, then, and not till then, he would diagnose peribronchial phthisis.

Dr. W. J. S. BYTHELL, in reply, said the discussion had been exceedingly useful and instructive ; but he had heard very little to throw doubt on his contention that in children—and his remarks were specially

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confined to them—the disease invariably started at the root of the lung.   Sir Douglas Powell misunderstood his figures when he quoted that 94 to 97 per cent. had phthisis, and he was scornful as to the prevalence of bronchial tuberculosis at Manchester.   At the Manchester Children's Hospital, in children dying from all causes the proportion was 55 per cent., which was below the rate given by most pathologists. Authorities varied, but from 60 to 90 per cent. of children dying from all causes were said to have tubercular bronchial glands.   The majority of children no doubt got over the infection, leaving fibrous or calcareous glands.   But that did not invalidate the argument that as long as bacilli were there the danger-spot was the infected bronchial glands.   He agreed with Dr. Lees that in every case the screen examination should be confirmed by taking a plate, as the latter showed much more ; also no doubt the skiagram should be an instantaneous one if possible.   In criticizing his (the speaker's) contention as to pulmonary tubercle being a root infection, Dr. Lees said very often the tubercle bacilli entered the system through the bronchial mucous membrane ; but he (Dr. Bythell) did not see that that made any difference.   If a child swallowed a big dose of the bacilli, they passed through the alimentary mucous membrane and got into the lymphatics.   If they secondarily infected the bronchial glands, in most cases these glands overcame the infection, but in others the glands broke down down and caseated.   According to Dr. Lees, this should be regarded as a primary infection of the digestive tract, but his (the speaker's) contention was that the first pathological lesion in the lung was an infection of the bronchial glands, extending thence to the lung tissue in the root.   If that were so, the recognition of this area of disease would result in the child being brought under treatment much earlier than otherwise.

It was necessary to insist at such a meeting as this, at which radio-graphers and clinicians were present, that it was not a question of the radiologist trying to upset the diagnosis of the clinician, or vice versa, or seeing which department could secure the earliest diagnosis.   One had simply to regard the X-rays as a sixth sense which had been put into the hands of the profession, and which must be used in combination with clinical methods.   In his hospital work he got the physicians to come down to the X-ray room to see the screen examination with him, and examine the plate, and the diagnosis was a result of mutual dis-cussion.   For instance, the presence of a shadow at the root, without other indication, he would hesitate to diagnose on ; but if there were also wasting, a cough, a temperature, a positive von Pirquet, and so on,

he would diagnose the presence of active tubercular infection of the root. He would like to ask radiologists present whether they had ever seen, even in the adult, a heavy apical shadow due to tubercular consolidation which was not accompanied by a much heavier shadow at the root. Had anyone seen a solitary focus in any part of the lung except at the root? If so, they had seen something which he never had.[1]

Dr. HORTON-SMITH HARTLEY said that the contention of Dr. Bythell that in children tuberculous disease of the lung originated in and extended from the bronchial glands might be true in not a few cases, but he thought it would be a pity for the meeting to dissolve with the belief that the same was necessarily true in the adult. He believed himself that this was not the case, for the conditions in the adult were not the same as in the child. In the adult patient suffering from phthisis, caseation of the bronchial glands was the exception. In 263 post-mortem examinations, which he had made at the Brompton Hospital, upon patients dying of chronic pulmonary tuberculosis, in only 9·1 per cent. were the bronchial glands found caseous. The antecedent condition, therefore, which made probable direct extension of disease from the bronchial glands into the lung, was of comparatively rare occurrence in the adult. He asked, further, whether the findings of morbid anatomy supported the doctrine that in the adult pulmonary tuberculosis started at the root of the lung, and he believed that they did not. When, for example, one made a post-mortem upon a case of phthisis, one lung was, as a rule, found to be extensively involved; in the opposite lung, on the other hand, the primary area of involvement was usually in the upper part, near the apex (whence the disease descended downwards through the organ), and not in the hilus or near the root of the lung. Again, when a person died and the lesions of arrested tubercle were found unexpectedly in the lung, in what portion of the organ were they discovered? Nearly always in the apical region, and very rarely near the root, whether such lesion consisted of a small calcareous nodule, an area of caseation surrounded by fibrosis, or a small cavity. He believed, further, that clinical observation agreed with such findings, and that very early in the disease altered physical

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[1] In the report of the meeting held on February 21, I regret that I failed to notice the omission of the reference to my quotation from Dr. Murray Leslie's paper on "Hilus Tuberculosis" in the *Clinical Journal* of January 22, 1913. The last ten lines of the report of my paper on p. 79 of the March Number of the *Proceedings* were a quotation of his views.—W. J. S. B.

signs could be discovered in the region of the apex, upon which, in conjunction with the symptoms, a diagnosis could be based. He agreed with Dr. Lees that in the majority of cases alteration of the percussion note was an early and most important sign. With regard to the X-ray appearances seen in the neighbourhood of the hilum in so many people, he believed that much further observation was required before we could be certain as to the interpretation of these shadows. He thought it very doubtful whether in most cases the radiating lines and striæ really represented areas of tuberculous infiltration, though the darker spots probably did reveal old calcareous foci in the bronchial glands. A valuable piece of research would be to examine a number of patients radiographically shortly before death, and then to compare the photographic appearances with the post-mortem findings. He ventured to suggest that in the cancer wards of the Middlesex Hospital such work might be done. At the present time even X-ray experts did not agree as to the meaning of the root shadows. There was, therefore, great need for a careful series of observations, so that the exact interpretation of these shadows might be definitely settled.

Dr. HARRISON ORTON : Having attended practically every discussion on the subject which has been held in London since the first one introduced by Dr. Stanley Green at the Clinical Society in 1904, when, as a matter of fact, there was no discussion at all, I have been much struck by the enormous amount of interest the subject has aroused this evening. It is evident that at last the importance of this examination is beginning to be recognized, for although our technique has improved immensely, chiefly owing to the possibility of obtaining practically instantaneous skiagrams, nevertheless, the main points brought forward in its favour are much the same. For years we have been familiar with the shadows at the roots of the lungs, the radiating lines, and mottled shadowing; nine or ten years ago Dr. Hickey, of Michigan, showed that these lines were due to the pulmonary vessels. Later, they have been shown to be due to the bronchi. The distribution of these is so similar that it is difficult to say from an examination of injected specimens to which they may be due, and I am not yet convinced that they are entirely due to bronchi, and still less that they indicate peribronchial tubercle, which some speakers seem to imagine. In justice to Dr. Jordan, however, I think I ought to say that I do not think he ever intended it to be understood that the lines were the result of tubercle, but the mottled

shadowing around them. Is there any reason why, in part at any rate, these lines should not be due to vessels? (Blood is an opaque material.) Has it ever been disproved that the mottled shadows may in part be produced by congestion around tubercular foci? Because we have glands at the root of the lung, is this any proof that the disease starts there? As one speaker has aptly put it, the glands are "dust-bins." A dust-bin must have refuse from somewhere to fill it. Where does the refuse in this case come from? At what stage is a tubercular lesion capable of casting a shadow? May not a lesion exist incapable of detection by any method at our disposal? Or perhaps attention is not called to it. A lesion which the dust-bins, in some cases, are able to deal with, the shadows in question being the result, then, of healed lesions. Whatever be the explanation, shadows at the roots of the lungs are almost always present in town-dwellers at any rate, radiating lines always, and therefore I think it must be admitted that within certain limits they are of no special importance in the diagnosis of pulmonary tuberculosis; we need some further evidence. However, one point seems clear—namely, that purely apical lesions are seldom seen on X-ray examination, the mottled shadowing is nearly always much more scattered; and I think this tends to show that the disease starts in a more scattered manner than is generally supposed, and is probably not recognized until a definite increase takes place in one particular spot. I agree with Dr. Barclay that a comparison of shadows after some considerable interval is of great value, and Dr. Walsham and I laid stress on this and gave the reasons for it in the little book we published in 1906. It is interesting to note that one negative, shown this evening, of a case in which there was no question of tubercle showed certainly quite as much, if not more, shadowing than some shown as definitely tubercular. The time is evidently not ripe, then, for us to say (to quote Sir Douglas Powell) "There the thing is, and it is no use arguing about it," but, rather, there the thing is, let us try and find out what it is, for our interpretation of "facts" is as yet by no means perfect.

I should like to take the opportunity of thanking Dr. Melville for his kindly reference to the work published by Dr. Walsham and myself some seven years ago.

Dr. WORRALL remarked that what had been said concerned chiefly early cases, but he would bring to notice a case of advanced disease which was sent to him at Westminster Hospital, by Dr. Carmalt Jones, for

X-ray examination. A young married woman, aged 26, was sent up as a case of pulmonary tuberculosis. On examining by the screen with the patient sitting—she could not lie down—he was struck with the great brilliance in the left upper half of the chest, chiefly the outer part. The area was limited below by a sharp horizontal line, and it remained horizontal when the patient inclined to either side. On the right side the lung appeared mottled all over, and near the apex was a large area almost as bright as the extra bright area on the other side. The report sent was, advanced pulmonary phthisis in right lung, the light area at apex indicating a considerable vomica. His interpretation on the left side was pneumo-hydrothorax. The shadow nearer the spine was cast by collapsed lung, and the horizontal line marked the limit of fluid in the chest. There was a rippling of that line synchronizing with the heart-beat. The mamma presented below a sharp outline, and at first suggested pericardium, but by displacing it for screen examination it became evident that it was breast. He would like to know what the explanation of these X-ray appearances was. He had shown these skiagrams to several X-ray experts and all agreed with the interpretation he had given. He would like to hear if anyone had a different interpretation to give, and the reasons for the conclusions.

No other interpretation of the X-ray appearances being suggested, Dr. Worrall proceeded to say that the patient had since died, and he showed post-mortem photographs of the two lungs. The right lung presented tuberculous disease throughout, with a large vomica in the apex, as suggested by the X-rays. The X-ray diagnosis as regards the left lung was quite wrong. There was no pneumo-hydrothorax. The lung presented complete unilocular cavitation, the fluid was contained in this cavity, and a catheter passed through a large bronchus communicating with the cavity showed where the atmospheric pressure was transmitted into the cavity. There was no fluid between the parietal and visceral pleuræ, which were adherent.

Dr. A. C. JORDAN : The discussion has turned largely on my own work, and has been most instructive to myself. No real divergence from my views and results has been expressed, but the discussion has shown that much misunderstanding exists concerning my views. I am glad to have this opportunity to explain matters.

The lungs of all healthy persons show blotches at the roots, and linear shadows radiating from the roots ; consequently, these appearances

are *not* indicative of active tuberculous disease of the lungs. I have demonstrated their true nature, and shown that the blotches are due to enlarged glands at the roots, while the linear shadows are thrown by fibrous tissue surrounding the air tubes. Since calcareous nodules are present in these glandular blotches in most cases, it is clear that they represent healed tuberculous infection. I am quite prepared to admit, however, that other bacteria may contribute to their formation.

I should like to point out that I hold no theory regarding the mode of infection in pulmonary tuberculosis; in my papers I have merely described facts observed by myself, and stated my deductions from those facts. Given the facts, the deductions follow naturally.

Several speakers have referred to me as holding the view that the glands at the roots are the primary source of infection of pulmonary tuberculosis. As I explained at the last meeting, I have never held this view; I regard it as illogical, just as I should regard the parallel statement that a tuberculous finger was secondary to tuberculous glands in the axilla.

The ordinary course of events in the early stages of phthisis I find to be as follows:—

(1) Catarrh of the air tubes; their lumen is found to contain epithelioid plates and secretion. This stage gives no X-ray signs.

(2) Migration of bacteria (including tubercle bacilli) through the walls of the air tubes, and consequent accumulation of leucocytes around the bronchial cartilages. This peribronchial small-celled infiltration gives rise to the radiating mottling, which is the characteristic X-ray feature of peribronchial phthisis. Even in its earliest stage this mottling is not confined to the roots but may extend to the periphery. The important feature is that from the commencement the mottling is distributed in a radial manner from the roots, and is purely peribronchial in its pathology. Hence the name "peribronchial phthisis" seems to me appropriate, and free from objection, while such names as "hilus phthisis," "central phthisis," &c., are not in any sense distinctive, while they suggest the erroneous idea that the hilus glands are the starting point of the disease. It is true these glands are often found to be caseous, especially in children, and sometimes they break down and cause infection of the neighbouring lung by direct contact; but this is an accidental occurrence, and has no bearing on the ordinary mode of origin of pulmonary tuberculosis.

The "failure to clear up" on inspiration at either apex is usually given as an indication of commencing tuberculous disease at that apex.

I regard this indication with great suspicion ; no doubt it does occasionally indicate commencing disease, but as a sign it is open to endless fallacies, and if noted conscientiously will lead to a diagnosis of phthisis in a large number of healthy persons.   My advice would be to note this failure to light up, but to be careful not to commit oneself to a diagnosis of phthisis on account of it unless there is actually mottling.   The presence of mottling affords a definite sign with a certain pathological significance—viz., points of peribronchial infiltration, and this mottling occurs very early.   " Doubtful " mottling is of no value in diagnosis ; fortunately, however, the " doubt " can always be cleared up by examining the suspected region through a small aperture.   If the mottling is real each individual spot will now be visible and can be pointed out on the fluorescent screen.   If the mottling is imaginary the region will appear clear through the small aperture.   Hence the golden rule : Do not diagnose phthisis unless you can show mottling through a small aperture, and show it on a photographic plate.

I have endeavoured to avoid repeating the contents of my published papers on peribronchial phthisis, but I hope I have succeeded in making my position clear.

Electro-Therapeutical Section.

April 18, 1913.

Dr. Reginald Morton, President of the Section, in the Chair.

Gastric Ulcer.

By Alfred C. Jordan, M.D.

It is my purpose to consider the use of the X-rays in the elucidation of the problems of gastric ulcer, discussing :—

(1) The diagnosis.
(2) The causes.
(3) Some of the terminations.

Diagnosis.

I do not propose to dwell on the diagnosis of acute gastric ulcer; the main interest centres on the chronic ulcers. I would merely state that acute gastric ulcers give rise to a spasmodic constriction at the site of the ulcer, and that the spasm is very persistent. I desire to state very clearly, however, that the converse is not necessarily true. I have many times seen a most persistent constriction at a particular point of the stomach, present at several examinations on different days, and yet at operation there was no constriction and no organic lesion discoverable.

Chronic gastric ulcers occur typically in two situations: at the pylorus and at the middle of the lesser curvature. In the case of the pyloric ulcers the appearance is well known. There is pyloric stenosis, or else (in earlier cases) pyloric spasm, the effect of which is equivalent to that of stenosis, since the spasm is permanent. The stenosis leads to

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dilatation of the stomach, the appearances of which, on X-ray examination with bismuth, are too well known to require special description (figs. 1A and 1B). One sign, however, calls for special mention—viz., reversed peristalsis. I had to wait several years before I encountered this sign for the first time, but in the last two or three years I have seen it well in eleven or twelve patients (figs. 1A, 3, and 10A). In each case there has subsequently been found an organic lesion at the pylorus—usually a gastric or duodenal ulcer. The phenomenon is quite unmistakable, strong waves passing from the stenosed pylorus, back along the curvatures toward the cardiac end of the stomach. Sometimes the peristaltic waves suddenly change their direction, so that a series of reversed waves is followed by a series of normal waves, or vice versa.
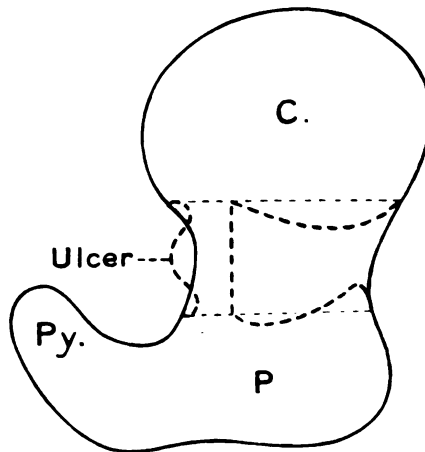
DIAGRAM A.

Stomach (firm outline) showing the production of the typical form of a chronic ulcer of the lesser curvature, with its depressed base and raised margins. The permanent contraction of the circular fibres over the ulcer (in the direction of the two fine dotted lines) gives rise to the hour-glass constriction. The cardiac portion (C.) becomes pouched from the weight of its contents. The pyloric portion (P.) acquires a nightcap-like projection upwards as the result of the pressure in this hypertrophied portion due to the spasm at the pylorus (Py.).

A most important point on which I desire to insist is the necessity of making a complete examination of the gastro-intestinal tract in all cases of gastric ulcer. On previous occasions I have explained the importance of a complete investigation in duodenal cases. When this is done it is found, regularly, that the same cause is at the root of both troubles, and that cause is intestinal stasis. The manner in which stasis leads to gastric ulcer will be clear from the instances I have to show to-night.

FIG. 1A.
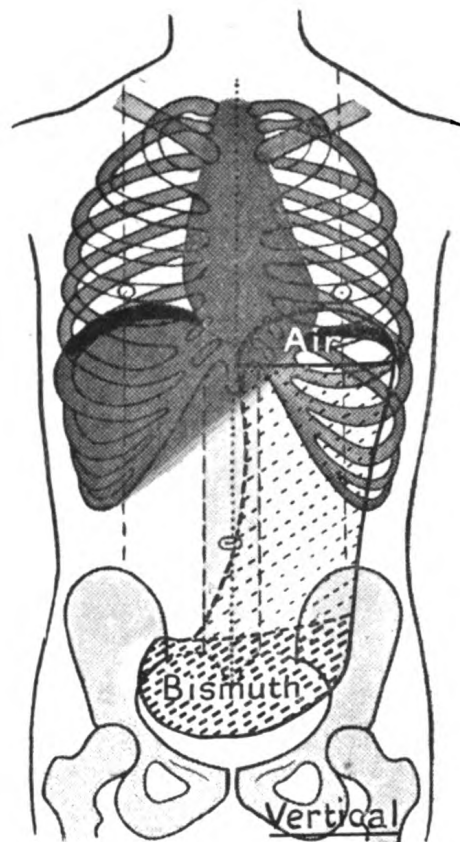
FIG. 1B.

Fig. 1A.—Stomach as shown on the couch after a bismuth meal in a case of pyloric stenosis due to a chronic ulcer in a man, aged 47. The stomach is greatly dilated ; there were powerful peristaltic waves, and on one examination definite reversed peristalsis was observed, strong waves passing, in regular sequence, from the pylorus back along the curvatures. At the end of fifty hours practically the whole of the bismuth was still contained in the stomach. *C.*, cardiac portion of the stomach; *Py.*, pylorus; *U.*, umbilicus. The arrows indicate the pyloric stenosis.

Fig. 1B.—Showing the appearance of a dilated stomach (due to pyloric stenosis) when examined vertically after a bismuth meal. The bismuth collects in a shallow pool at the lowest point (in the pelvis). Above the bismuth the liquid contents of the stomach are shown ; a collection of air under the diaphragm occupies the fundus of the stomach, and is separated from the gastric fluid by a horizontal line at which splashing is seen on shaking the patient.
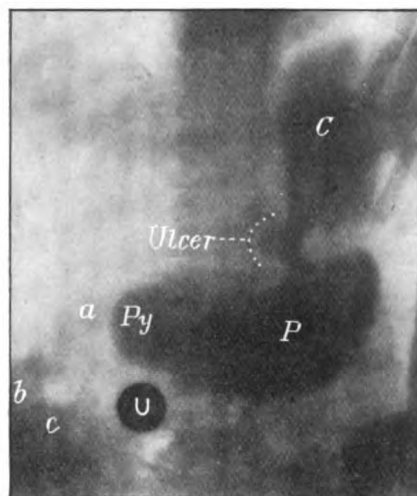
FIG. 2.
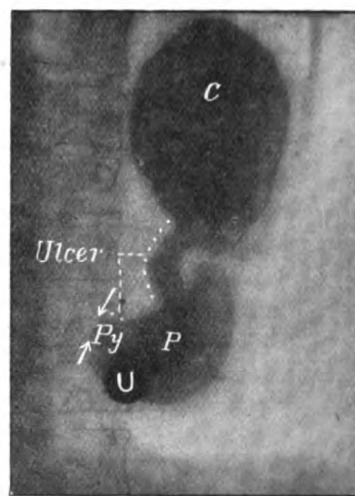
FIG. 3.

Fig. 2.—Taken on the couch after a bismuth meal, showing a typical chronic ulcer of the lesser curvature in a woman, aged 51 (thought to have been carcinoma prior to the X-ray examination). Showing the depressed base of the ulcer, its crater-like margins, and a tight, hour-glass constriction due to spasm of the circular muscle-fibres of the stomach over the area of the ulcer, reducing the lumen of the stomach to a narrow passage. This constriction is permanent except under general anæsthesia. The large size of the pyloric portion of the stomach shows that there must have been great dilatation of the stomach before the ulcer existed. The pyloric spasm which caused this dilatation is still present. The duodenum showed well-marked " writhing " contractions. After twenty-four hours there was still bismuth in the pyloric portion of the stomach ; the terminal coil of the ileum was hypertrophied and tender. The aortic arch showed atheromatous elongation and dilatation—a change very apt to occur in the subjects of intestinal stasis. *C., P.,* cardiac and pyloric portions of the stomach ; *Py.,* pylorus ; *a, b, c,* first, second and third parts of the duodenum ; *U.,* umbilicus, marked by a penny.

Fig. 3.—Taken on the couch after a bismuth meal, showing a typical chronic ulcer of the lesser curvature in a man, aged 28. There was pain half an hour after food, and tenderness to pressure under the left costal margin. There had been two attacks of hæmatemesis, one four, the other two years ago. In addition to the typical appearances of a chronic ulcer of the lesser curvature (*see* description of fig. 2) there was tight organic stenosis at the pylorus, with strong anti-peristaltic contractions occurring in groups, alternating with groups of strong waves in the normal direction. At the operation two chronic gastric ulcers were found : one at the pylorus, the other on the lesser curvature. There was scarcely any hour-glass constriction under the general anæsthetic. *C., P.,* cardiac and pyloric portions of the stomach ; *Py.,* pylorus. The arrows indicate the pyloric stenosis.

The constant occurrence of duodenal distension in intestinal stasis is now so well known that I shall take it (and its cause) for granted, referring those who have not yet had opportunities of familiarizing themselves with the subject to my recent writings,[1] and to the well-

FIG. 5.
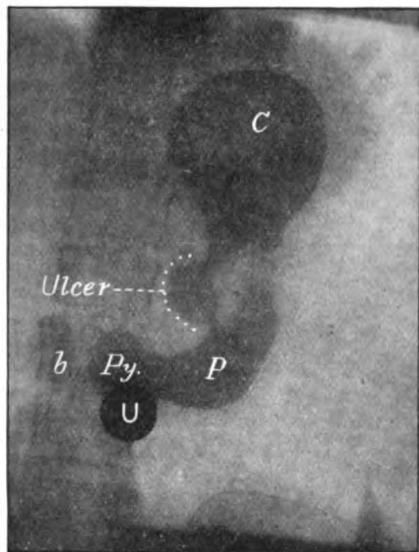
FIG. 4.

Fig. 4.—Taken on the couch after a bismuth meal, showing a typical chronic ulcer of the lesser curvature in a woman, aged 28. She had been constipated and bilious since a girl. Pain, vomiting and wasting for ten months. The typical characters, as shown on the couch, are well seen. The nightcap-like projection upwards from the pyloric portion is very well shown. There was moderate spasm at the pylorus. The duodenum was best seen after one hour; it was dilated, especially in its first part (confirmed by operation). The aortic arch showed slight general dilatation. *C.*, *P.*, cardiac and pyloric portions of the stomach; *Py.*, pylorus; *b*, second part of the duodenum; *U.*, umbilicus.
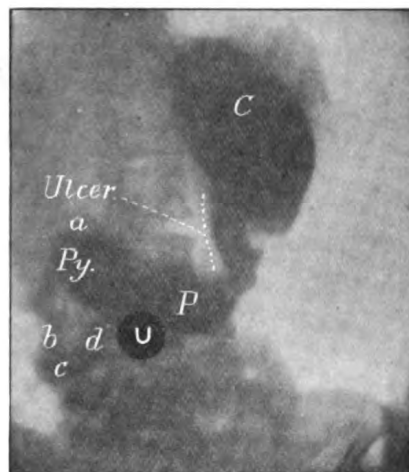
Fig. 5.—Large chronic ulcer of the lesser curvature in a woman, aged 43. Taken on the couch, showing a modification of the typical form. Abdominal pain and vomiting for a year. Some pyloric spasm; duodenum elongated and tortuous (confirmed by operation). *C.*, *P.*, cardiac and pyloric portions of the stomach; *Py.*, pylorus; *a*, *b*, *c*, *d*, first, second, third and fourth parts of the duodenum; *U*, umbilicus.

known publications of Mr. Arbuthnot Lane.[2] The effect of duodenal distension upon the stomach is great. The high pressure in the

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[1] *Proc. Roy. Soc. Med.*, 1911, v (Electro-Therap. Sect.), pp. 9-37; or *Lancet*, 1911, ii, p. 1824; *Brit. Med. Journ.*, 1912, i, p. 1225; *Practitioner*, 1913, xc, pp. 441-54.

[2] *Proc. Roy. Soc. Med.*, Discussion on Alimentary Toxæmia, pp. 49-117.

duodenum causes the stomach to work abnormally hard to get its
contents out through the pylorus. As soon as a portion of the gastric
contents has made its way into the duodenum the pylorus closes
behind it to prevent regurgitation. Physiological experiments show
that spasmodic closure of the pylorus always occurs (apart from
duodenal distension) when acid materials pass into the duodenum ; in
gastric ulcer the contents of the stomach are often very acid. The
spasm set up in these two ways has a great tendency to become per-
sistent, and to produce a state of affairs closely simulating organic
stenosis (figs. 2, 6, 9, and 14). The difficulty of demonstrating radio-
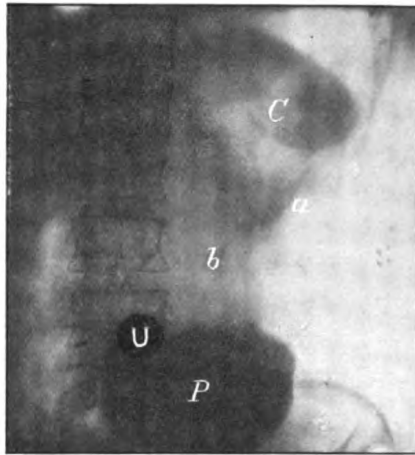
FIG. 6A.
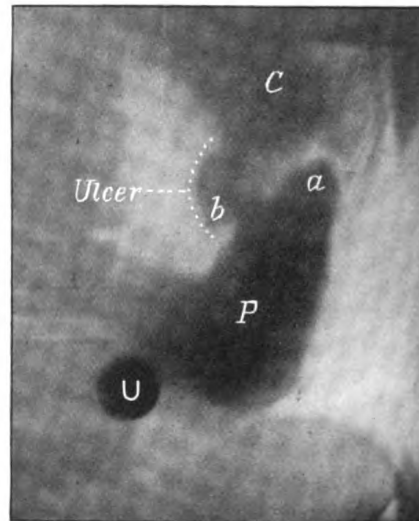
FIG. 6B.

Typical chronic ulcer of the lesser curvature in a woman, aged 48, contrast-
ing the appearance as shown when the patient is examined upright (fig. 6A) and
on the couch (fig. 6B). There had been pain and vomiting for seven or eight
years. In the vertical posture the depressed base of the ulcer is represented
merely by a small collection of bismuth at b, while the nightcap-like projection
upward from the pyloric portion is shown filled with air (a). Note the large
size and low position of the pyloric portion of the stomach, showing that there
had been long-standing pyloric spasm, which had caused dilatation of the
stomach before the appearance of the ulcer on the lesser curvature. After one
hundred hours there was still bismuth in the large intestine. C., P., a, b, are
corresponding points on the two pictures.

graphically the duodenal distension in stasis is due, in great measure, to
this pyloric spasm ; it must be overcome, and the best way known to
me is to give a large dose of carbonate of bismuth in an emulsion, an

hour or so after a meal (usually breakfast), and to place the patient on the right side (on the couch) for a minute or two before examining him on his back. Occasionally a little bicarbonate of soda must be added before the pyloric spasm will yield, and if there is an ulcer the spasm will not yield even then, or even with the further addition of morphine and atropine. By this method an accurate report on the condition of the duodenum can be given in nearly every case. On turning the patient from the right lateral to the supine posture the duodenum is seen well filled with bismuth emulsion. In a normal case it is narrow and short, and the bismuth is seen to pass through the duodenum, and
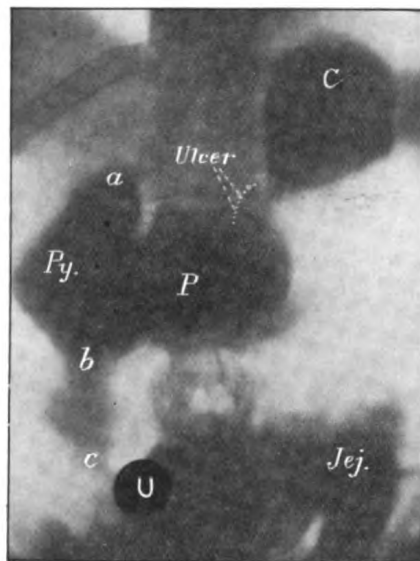
FIG. 7.

Taken on the couch after a bismuth meal, showing a chronic ulcer of the lesser curvature in a woman, aged 37. She had pain twenty minutes after food. Vomiting five weeks. Two weeks ago she vomited 3 pints of blood. The pyloric portion of the stomach is large; the duodenum is elongated, and greatly dilated, especially in its first part (confirmed by operation). *C.*, *P.*, cardiac and pyloric portions of the stomach; *Py.*, pylorus; *a*, *b*, *c*, first, second and third parts of the duodenum; *Jej.*, jejunum; *U.*, umbilicus.

on into the jejunum so rapidly that no photograph of it can be obtained with an ordinary apparatus. In stasis, however, the behaviour of the duodenum is quite different; in well-marked cases it is much too long and much too wide, especially in its first part. It shows strong peristaltic contractions, but these are unable to forward the contents

of the duodenum into the jejunum ; there is repeated regurgitation of the bismuth from the third and fourth to the second part of the duodenum, and in severe cases the duodenal contractions amount to strong writhing movements.   In such cases the bismuth remains in the duodenum many minutes, and it is an easy matter to obtain a skiagram of it by inserting a photographic plate beneath the fluorescent screen, and leaving it there while observing the behaviour of the duodenum. All intermediate stages are found, according to the degree of the stasis. I have described this before, and should not repeat the description were it not that I find there is still a tendency to attribute my results to
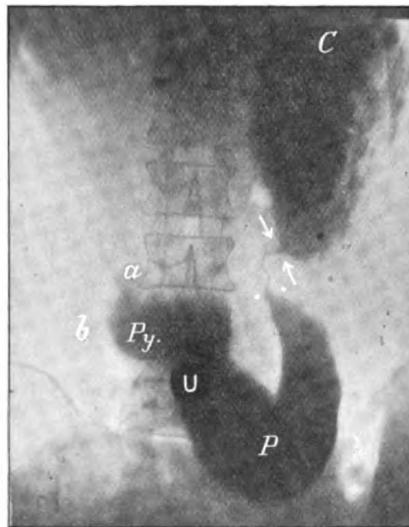
Fig. 8a.

Stomach of a woman, aged 45, taken on the couch an hour after a bismuth meal. A very thin streak may be seen joining the cardiac to the pyloric portion of the stomach. More than half the bismuth is still contained in the cardiac portion. The pyloric portion is enlarged and dropped. At the operation, performed a few days later, the stomach appeared as a large sac, showing no sign of an hour-glass constriction, and no ulcer could be felt although it was thought to be there. A gastro-enterostomy was performed. Two days later a fatal hæmatemesis occurred, and the post-mortem examination showed a chronic ulcer of the lesser curvature. *C.*, *P.*, cardiac and pyloric portions of the stomach ; *Py.*, pylorus ; *a*, *b*, first and second parts of the duodenum ; *U*, um-bilicus.   The arrows point to the hour-glass constriction.

my method, inferring that a normal duodenum would behave in the way I describe.   I cannot repeat too clearly that this is not the case ; all my patients take a large dose of bismuth, and are examined in the same way, and the " static " duodenums can be picked out from among the

normals with the greatest certainty. My results, both normal and abnormal, have been tested over and over again at operations, and have been found accurate.

EFFECTS OF PYLORIC SPASM.

Returning to the stomach after this necessary diversion, let us inquire what is the result of the continued pyloric spasm; it is similar to that of pyloric stenosis; the stomach, being unable to evacuate its contents in the normal time, becomes overloaded and begins to dilate and to be dragged down by its own excessive weight. The mechanics of this has been fully explained by Mr. Arbuthnot Lane. The stomach is suspended by

FIG. 8B.

FIG. 8C.
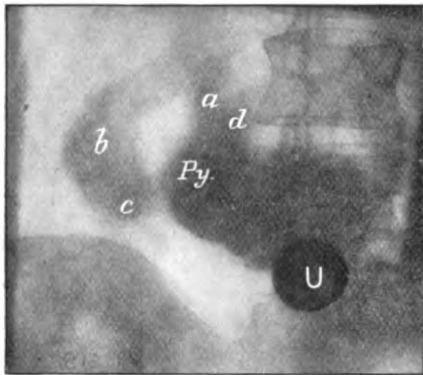
Fig. 8B.—Taken on the couch immediately after fig. 8A, showing the big duodenum. Strong "writhing" contractions were seen, bismuth appearing repeatedly in the fourth part of the duodenum at *d*, and returning again and again to *c* and *b*. *Py.*, pylorus; *a, b, c, d*, the four parts of the duodenum; *U.*, umbilicus.
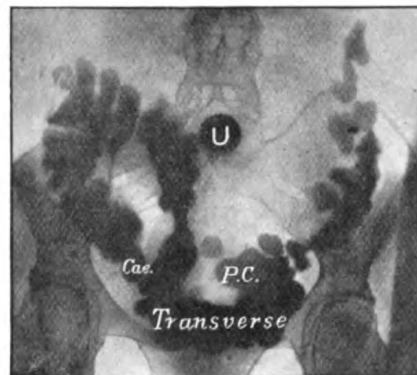
Fig. 8C.—Taken seventy-two hours after the same bismuth meal, showing great stasis in the dropped large intestine, very little bismuth having passed beyond the middle of the transverse colon after this time. *Cæ.*, cæcum; *P.C.*, pelvic colon; *U.*, umbilicus.

its two "ligaments," at the pylorus and the œsophagus. The weight of the overloaded transverse colon is added to that of the overloaded stomach, and eventually an ulcer is formed at the point of greatest strain—the pylorus. The pyloric spasm then becomes more complete, and the overloading of the stomach becomes greater still, so that there is little chance for the ulcer to heal. If there is general dropping of the viscera (and the dilated stomach pulls the other viscera down), and if

the liver drops, carrying the pylorus down with it, the point of greatest strain is shifted from the pylorus to the lesser curvature, and an ulcer may then appear at this point. It will be understood that the mechanical factor furnishes the predisposing cause; the actual determining cause is microbic, and perhaps in part chemical; the colon bacillus has been found in pure culture in the depressed base of chronic ulcers of the stomach.
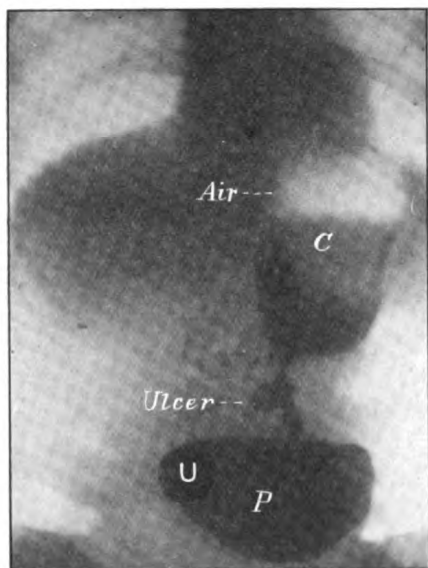
FIG. 9A.
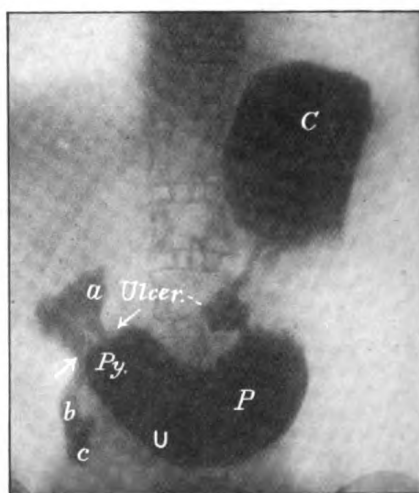
FIG. 9B.

Typical chronic ulcer of the lesser curvature in a woman, aged 58, taken vertically (9A) and on the couch (9B), showing the depressed base of the ulcer and the tight spasmodic constriction of the circular fibres of the stomach over the ulcer. As usual, there was persistent spasm at the pylorus, with dilatation and dropping of the pyloric portion of the stomach. The duodenum was elongated and dilated, especially in its first part; it showed marked "writhing" contractions, with repeated regurgitation, only small amounts entering the jejunum in spite of the strong duodenal contractions. After twenty-four hours fully one-third of the bismuth was still contained in the pyloric portion of the stomach. (*See* also fig. 9c.) *C.*, *P.*, cardiac and pyloric portions of the stomach; *U.*, umbilicus; *Py.*, pylorus; *a*, *b*, *c*, first, second and third parts of the duodenum. The arrows indicate the persistent pyloric spasm, simulating organic stenosis.

CHRONIC ULCER OF THE LESSER CURVATURE.

These chronic ulcers of the lesser curvature form a most fascinating study; as shown on the couch the picture is very characteristic (figs. 2, 3, 4, 5, 6, 7, 8, and 9); the depressed base of the ulcer occupies some

point of the lesser curvature; it is usually adherent to the tail of the pancreas—sometimes to the left lobe of the liver. The raised, crater-like margins of the ulcer are well seen, but the most striking feature is the firm spasmodic contraction of the circular fibres of the stomach over the area of the ulcer, giving rise to a tight hour-glass constriction, with a narrow isthmus joining the cardiac to the pyloric portion of the stomach. This constriction is permanent, except under an anæsthetic. This is a fact of the greatest importance to surgeons, for at operations they see the stomach fully open, with little or no hour-glass appearance,
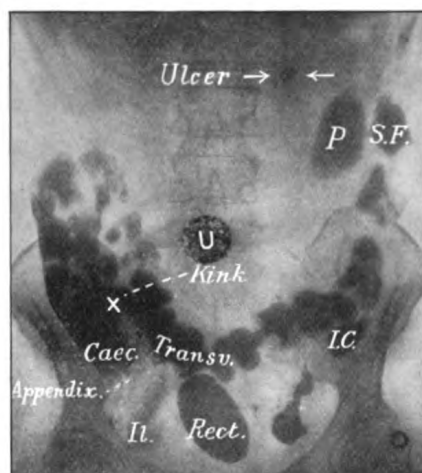
FIG. 9c.

Taken on the couch forty-seven hours after the same bismuth meal, showing that there is still bismuth in the pyloric portion of the stomach and in the depressed base of the ulcer. There was great stasis in the large intestine, and at the end of seventy-two hours most of the bismuth was still contained in the cæcum, ascending colon, and dropped transverse colon. The appendix was shown to be normal. At the operation there was found to be a chronic ulcer of the lesser curvature, adherent, and causing only slight organic constriction. The pylorus was tied by bands to the under surface of the liver, but there was no pyloric stenosis. The duodenum was prominent. There was a well-marked ileal kink, holding down the terminal coil of the ileum (*Il.*) in the right iliac fossa. Mr. Lane "short-circuited" the ileum into the upper part of the rectum, leaving the stomach untouched. The yellow skin and the cold, unpleasant sweat cleared up within six weeks of the operation, and the hands became warm and dry. The chronic mastitis subsided, and she felt much better. Six months later she was well and was working as a maid. She had suffered from severe dyspepsia and constipation for many years. For six months she had great pain, especially after food, and vomiting. Never hæma-temesis. She had lost weight for one year. *P.*, pyloric portion of the stomach; *S.F.*, splenic flexure; *Cæc.*, cæcum; *I.C.*, iliac colon; *U.*, umbilicus; *Transv.*, transverse colon; the **X** marks the ileo-cæcal entrance.

and they are very apt to overlook the fact that the constriction will return as soon as the effect of the anæsthetic has passed off. The surgeon may even select the seat of the ulcer for his gastro-enterostomy opening—with disastrous results. The form of the stomach in a typical case is remarkably constant; one would never have guessed that the pyloric portion of the stomach would present a sharp nightcap-like
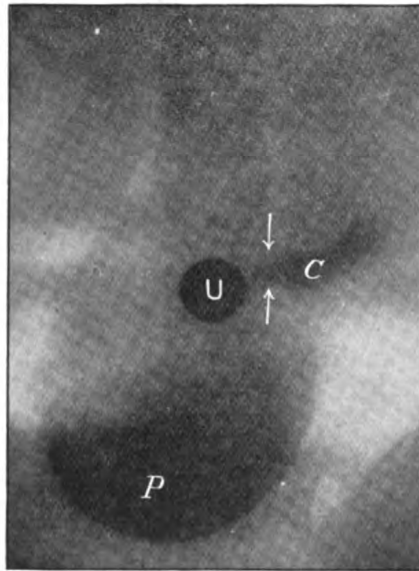
Fig. 10A.

Fig. 10B.

Fig. 10A.—Taken vertically, showing the stomach of a woman, aged 30; there had been attacks of epigastric pain since the age of 14, coming on every few months and lasting four or five days. At the age of 20 the pain became continuous, and vomiting began. She was apt to vomit food eaten the previous day; never blood. The vertical examination revealed an hour-glass constriction; the pyloric portion of the stomach was greatly dilated and dropped. On the couch reversed peristalsis was observed, strong waves passing from the pylorus back along the curvatures. After nine hours no bismuth had left the stomach. *C., P.,* cardiac and pyloric portions of the stomach; *U.,* umbilicus. The arrows indicate the hour-glass constriction. (*See* also fig. 10c.)
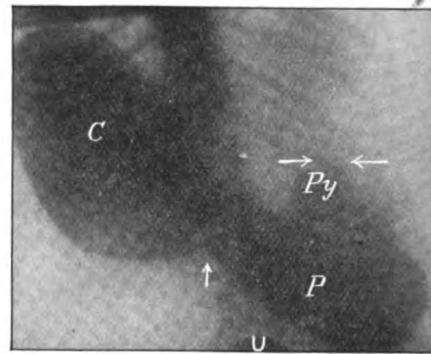
Fig. 10B.—Taken prone immediately after fig. 10A, showing the hour-glass constriction, marked by an arrow, and the organic stenosis at the pylorus (*Py.*), marked by two arrows. *C., P.,* cardiac and pyloric portions of the stomach; *U.,* umbilicus.

projection upwards at the seat of the ulcer (figs. 2, 3, 4 and 6), yet one has only to draw a diagram of the stomach with the ulcer, and represent on the drawing the effect of the abrupt shortening of the circular fibres

over the ulcer and nowhere else, to see how the particular form of the stomach arises (diagram A).

In most cases of chronic ulcer of the lesser curvature it is obvious, from the large size of the pyloric portion of the stomach, and from the low position of this portion when examined vertically, that gastric dilatation preceded the formation of the ulcer. This fits in with the explanation already given, for the pyloric spasm was there long before the ulcer appeared on the lesser curvature, and in addition the pylorus is often slung up to the under surface of the liver by bands which catch up the gall-bladder as well (fig. 9c). In quite a good proportion of cases there is also an ulcer at the pylorus (fig. 3), a very chronic ulcer, perhaps cicatrizing. The explanation of this has already
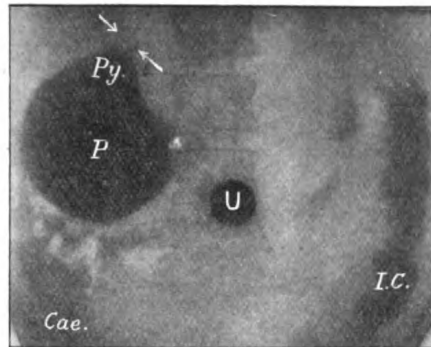
FIG. 10c.

Taken on the couch forty-eight hours after the same bismuth meal, showing the greater part of the bismuth still in the pyloric portion of the stomach. The terminal coil of the ileum contained traces of bismuth, and was hypertrophied, for it could be felt as a cord. After seventy-two hours there was still a large amount of bismuth in the stomach. At the operation Mr. James Sherren found a cicatrized ulcer of the lesser curvature, and a duodenal ulcer, just beyond the pylorus, with hard, thick edges, producing great stenosis. The terminal coil of the ileum was thick ; the appendix was free, its tip obliterated by fibrous tissue. Mr. Sherren performed two gastro-jejunostomies, the loop of jejunum being united in turn with the pyloric and the cardiac sac of the stomach. The patient made an excellent recovery, and four months later was apparently cured.

been given. I shall now show typical cases illustrating the X-ray appearances of gastric ulcer, and proving its origin from intestinal stasis (*see* descriptions of figs. 2 to 12).
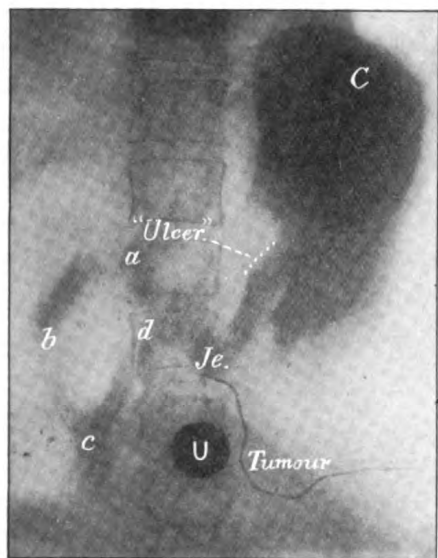
FIG. 11A.
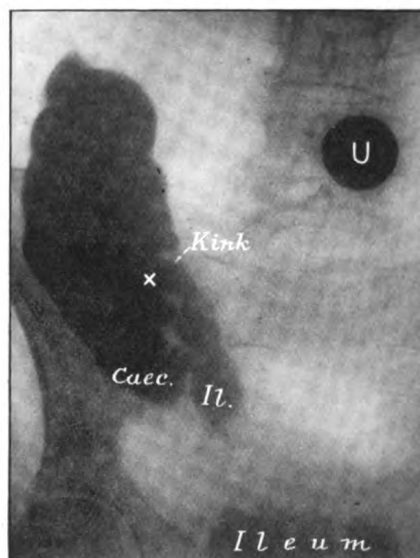
FIG. 11B.

Fig. 11A.—The stomach and duodenum of a woman, aged 45, taken on the couch after a bismuth meal (administered vertically as usual). There was a tumour felt in the left side of the abdomen ; it was smooth and tender ; the wire marks its lower border. For five years there had been pain coming on two hours after meals, and relieved by food and by alkalies. Pain came on also at 2 a.m. Six months ago she used to vomit ; she was constipated and depressed. The X-ray examination showed, in a modified form, the characteristic appearance of a chronic ulcer of the lesser curvature, causing a well-marked hour-glass constriction. The tumour was connected with this part of the stomach. The pylorus was normal, the duodenum elongated. *C.*, cardiac portion of the stomach ; *a, b, c, d*, the four parts of the duodenum ; *Je.*, jejunum ; *U.*, umbilicus. (*See* also fig. 11B.)

Fig. 11B.—Taken on the couch nine hours after the same bismuth meal, showing an ileal kink near the ileo-cæcal entrance, and the terminal coil of the ileum somewhat dilated. After twenty-six hours most of the bismuth was contained in the cæcum, ascending and transverse colon—the latter being much dropped. The appendix appeared normal. *Cæc.*, cæcum ; *Il.*, terminal coil of the ileum ; *U.*, umbilicus. The **X** marks the ileo-cæcal entrance. At the subsequent operation Mr. D. J. Armour found a chronic ulcer of the lesser curvature surrounded by much hard inflammatory tissue. He performed a posterior gastro-jejunostomy above the mass, with a good result. An enlarged gland was removed for examination, and proved to show inflammatory changes only, but five months later it became evident that there was malignant involvement.

TERMINATIONS.

What is the fate of these chronic ulcers of the lesser curvature? Many of them persist for years, often unrecognized, though the X-ray
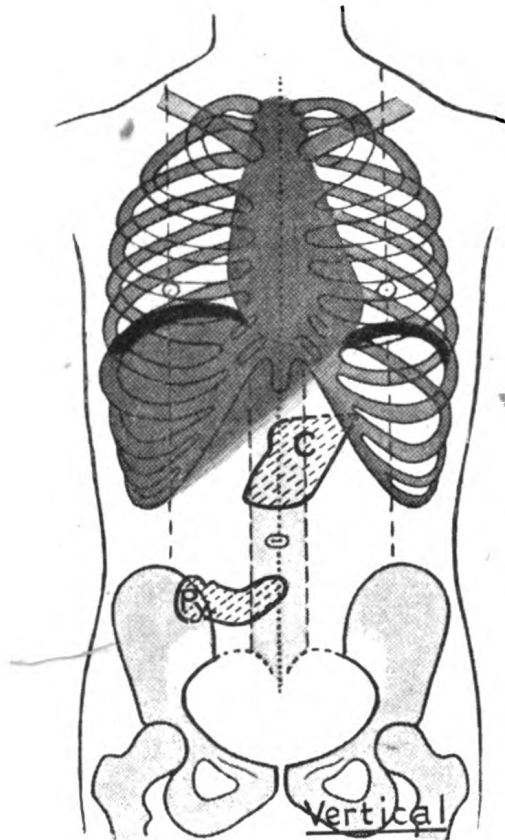
FIG. 12.

Taken vertically ten minutes after a bismuth meal (a smooth emulsion which the patient drank) in a woman, aged 39, showing the main bulk of the bismuth in the cardiac portion of the stomach (*C.*), and a small collection in the pyloric portion, which is dropped, but shows normal peristalsis and a normal pylorus (*Py.*), except for spasm. When first examined in the upright posture no bismuth entered the pyloric portion, and on subsequent examinations the whole of the bismuth remained in the cardiac portion of the stomach, no bismuth being ever again seen in the pyloric portion. At the operation a very tight fibrous hour-glass constriction was found.

examination will "change all that" in the near future. A few cicatrize completely, leaving a scar with a varying amount of hour-glass constriction (figs. 10 and 12). This may be so tight that no bismuth can be

seen to pass through the constriction. In the case of a woman, aged 39, who was sent to me in the first instance as an out-patient, I suspected, from the appearance of the stomach shadow with a bismuth emulsion, that I was observing only the cardiac portion of an hour-glass stomach, although not a trace could be seen to pass out even with the smallest diaphragm. Accordingly I kept her sitting in a chair for ten minutes and examined her again. This time I was rewarded by finding a small pool of bismuth below the level of the iliac crests, showing normal gastric peristalsis and a normal pylorus, though there was some spasm there (fig. 12). The bulk of the bismuth was still contained in the
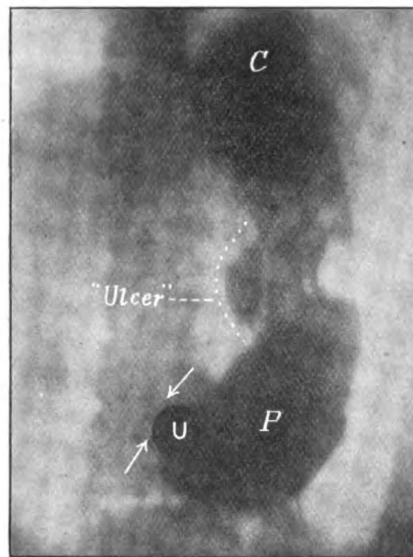
Fɪɢ. 13.

Stomach of a woman, aged 46, taken on the couch after a bismuth meal, showing the typical characters of a chronic ulcer of the lesser curvature: The depressed base of the ulcer, the raised margins, the dilated pyloric portion, with spasm at the pylorus. The sole distinction is in the lighter areas in the neighbourhood of the ulcer, found subsequently to be due to nodules of cancer. In this case the actual transition from a simple chronic ulcer to a cancer is illustrated. (*See* also figs. 14ᴀ and 14ʙ.) *C., P.*, cardiac and pyloric portions of the stomach ; *U.*, umbilicus. The arrows indicate the pyloric spasm.

cardiac pouch. This patient was admitted to the hospital next week, and sent down to me again for confirmation of the diagnosis, but although I examined her several times, at different intervals after taking the bismuth (half an hour, two hours, several hours), I was

never again able to show any bismuth in the pyloric portion of the stomach. The first examination was so definite, however, that I adhered to the diagnosis then made, although the clinical examination did not seem to fit in with it. Mr. Charters Symonds operated, and found a very tight cicatricial hour-glass constriction, for which he performed the operation of gastro-gastrostomy with good result.
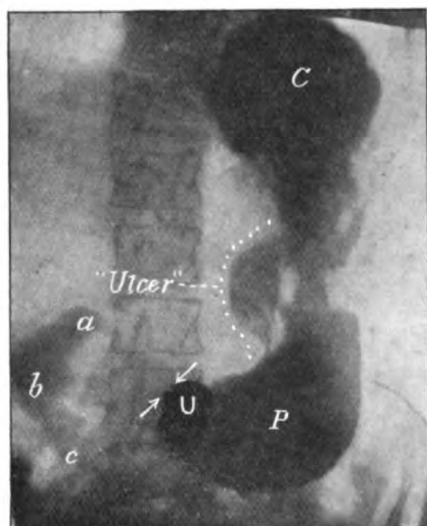
Fig. 14a.

Fig. 14b.

Fig. 14a.—Another view of the same stomach taken a week later, showing the same characters, and indicating, in addition, the dilated duodenum. C., P., cardiac and pyloric portions of the stomach; U., umbilicus; a, b, c, first, second and third parts of the duodenum. The arrows indicate the pyloric spasm. There was constipation, and abdominal pain an hour after meals. (*See* also fig. 14b.)
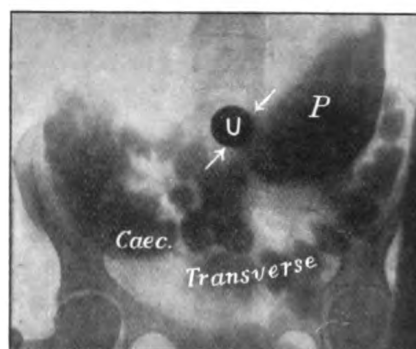
Fig. 14b.—Taken twenty-four hours after the same bismuth meal, showing the greater part of the bismuth still in the pyloric portion of the stomach, and no bismuth beyond the splenic flexure. The transverse colon is greatly dropped. After seventy-two hours there was still a large amount of bismuth in the pyloric portion of the stomach (P.). The arrows indicate the spasm at the pylorus. At the operation a malignant growth of the stomach was found, infiltrating the omentum, with secondary glands in the portal fissure. There was no pyloric stenosis, the permanent spasm having passed off under the general anæsthetic. Cæc., cæcum; U., umbilicus.

CANCER.

A good many chronic gastric ulcers meet with a different fate; they become cancerous. This is a fact which has often been denied,

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but radiography affords positive proof of its accuracy (figs. 11 and 13
to 18). Early cases of cancer often show the typical appearance of
a chronic gastric ulcer, with only slight alteration due to the malignant
involvement (figs. 11, 13 and 14). Even fairly advanced cases, where
there is an obvious tumour to be felt, sometimes show the typical
appearance quite clearly, though with a varying amount of modification
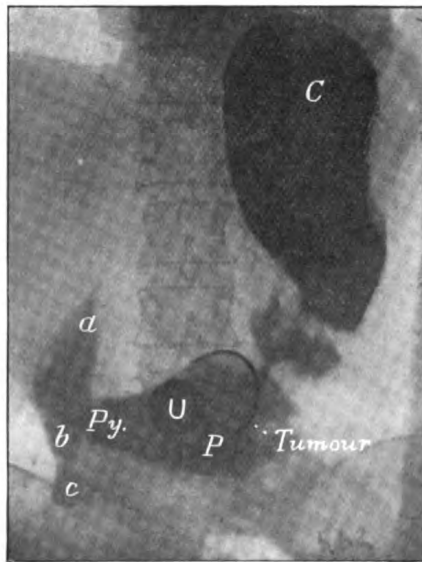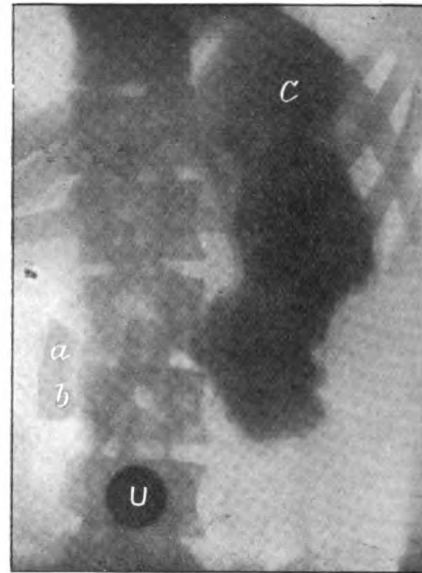
FIG. 15.   FIG. 16.

Fig. 15.—The stomach and duodenum of a woman, aged 60, taken on the couch
after a bismuth meal. Epigastric pain after food for two years ; worse the last
six weeks. Constipation ; great wasting ; no vomiting. The X-ray appearances
are those of chronic ulcer in caricature. The wire marks the position in which
a tumour was felt. The duodenum was dilated, and showed well-marked
"writhing" contractions. The origin of the cancer in a chronic ulcer of the
lesser curvature is still evident, though the deviation from the typical form is
greater than in the case of figs. 13 and 14. The duodenum supplies evidence of
intestinal stasis. The aortic arch showed considerable atheromatous elonga-
tion, and slight fusiform dilatation. *C.*, *P.*, cardiac and pyloric portions of the
stomach ; *Py.*, pylorus ; *a, b, c*, first, second and third parts of the duodenum ;
U., umbilicus.

Fig. 16.—The stomach of a man, aged 37, taken on the couch after a bismuth
meal. For two years there had been pain half an hour after food ; blood was
vomited two years ago. Vomiting for the last five months ; wasting. The picture
shows great irregularity of outline of the stomach with stenosis of the pyloric
portion, only traces of bismuth trickling through. Even here the appearance of
the lesser curvature suggests dimly the origin of the cancer in a chronic ulcer,
and the history adds probability to this supposition. *C.*, cardiac portion of the
stomach ; *a, b*, traces of bismuth in the duodenum ; *U.*, umbilicus.

(figs. 15 to 18). In such cases (with a palpable tumour) the origin from a chronic ulcer is not nearly so obvious on direct inspection (at an operation or at a post-mortem) as it is in the X-ray picture. Sometimes the skiagram shows a veritable caricature of the picture of a chronic ulcer (fig. 15). Another point—a very important one; all
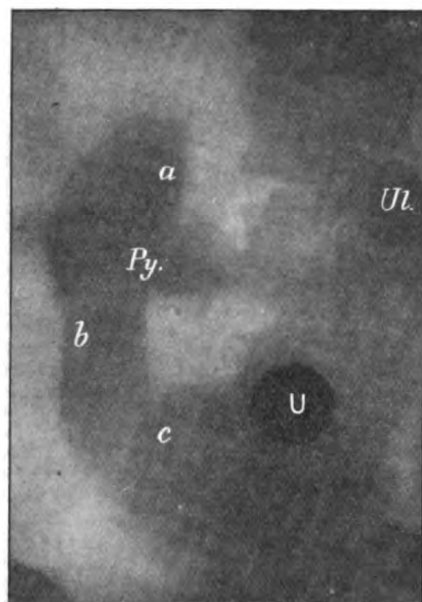
Fig. 17A.

Fig. 17B.

Fig. 17A.—Gastric "ulcer," pylorus and duodenum in a man, aged 45, taken on the couch after a bismuth meal. He had pain coming on after food, and relieved by eating; he had lost weight during the last six months; constipation, which had become extreme the last four months. The X-ray examination showed an hour-glass constriction, with a pouch in the position of the lesser curvature (*Ul.*). The pylorus was normal; the duodenum was greatly distended; its first part much dilated. *Py.*, pylorus; *a, b, c,* first, second and third parts of the duodenum; *U.*, umbilicus. (*See* also figs. 17B and 17c.)
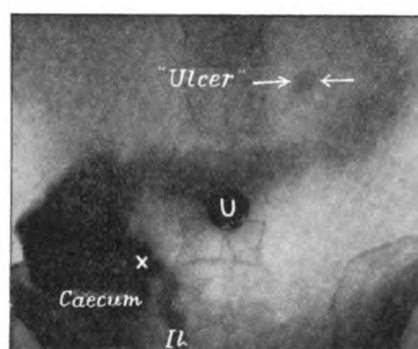
Fig. 17B.—Taken on the couch eight hours after the same bismuth meal. The base of the "ulcer" still contained bismuth, and was very tender to pressure. There was a trace of bismuth in the terminal coil of the ileum; the remainder occupied the large intestine. The appendix was shown to be normal. *Il.*, terminal coil of the ileum; *U.*, umbilicus. The **X** marks the ileo-cæcal entrance. (*See* also figs. 17A and 17c.)

the patients exhibit the characters of intestinal stasis, and the distended duodenum can usually be shown on the same picture as the stomach (figs. 11A and 11B, 14A and 14B, 15 and 17).

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Thus we have a further illustration of the importance of intestinal stasis in the ætiology of malignant disease. When stasis is recognized by medical practitioners in its early stages, and rectified, there will be far less cancer, not only of the stomach and large intestines but also of the bile-ducts and pancreas, and of the breasts. All must agree, therefore, as to the immense importance of recognizing the primary disease early, and of subjecting the patients to effective treatment. Few cases would call for operation if this were done.
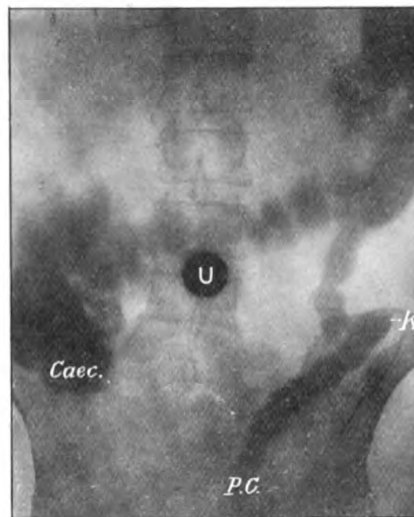
FIG. 17c.

Taken on the couch twenty-five hours after the same bismuth meal, showing all parts of the large intestine, and a sharp kink of the iliac colon just below the left iliac crest, the bowel being firmly fixed to the iliac fossa at this point (*K*.). At the end of thirty-six hours the pelvic colon was shown to form a long loop, rising almost to the level of the umbilicus. All parts of the large intestine still contained bismuth at the end of forty-eight hours. *Cæc.*, cæcum ; *P.C.*, pelvic colon ; *U.*, umbilicus. At the operation there was found to be a malignant growth of the lesser curvature with an extensive mass behind the stomach, extending down to, and below the great curvature, which was involved. There was much growth in the transverse meso-colon, and nodules throughout the great omentum and elsewhere. The duodenum was distended; its first part much dilated. The kink of the iliac colon was very tight.

EARLY DIAGNOSIS.

In the early diagnosis of the changes occurring in intestinal stasis the radiologist takes a most important share; he must work out his method with a view to demonstrating these changes in their earliest

stages, before any definite symptoms have appeared that can be put
down directly to their influence. I am frequently able to demonstrate
an ileal kink in its very beginning, when it consists of nothing more
than a slight local thickening in the mesentery of the last inch or
two of the ileum. It is far easier to recognize an extreme kink
with permanent obstruction. In its slight degrees there is no
obstruction; only moderate difficulty in the upright posture, accen-
tuated when the cæcum is overloaded and the patient fatigued from
prolonged exertion. Even the early stages of ileal kink produce their
inevitable reaction on the duodenum, which becomes distended, and
secondarily on the stomach in the manner I have explained already.
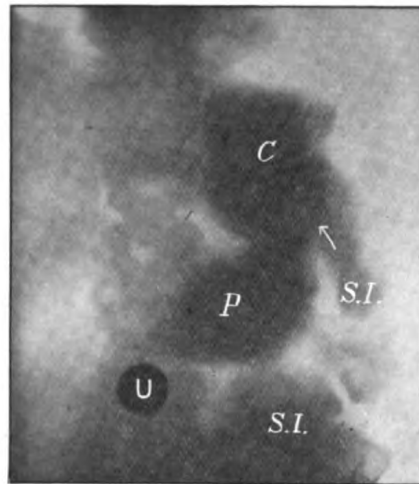
FIG. 18.

Taken on the couch after a bismuth meal in a man, aged 58, suffering from
pain and vomiting for three months, the vomit containing fæcal matters and no
free hydrochloric acid. There is an hour-glass constriction, the form of which
suggests its origin in a chronic ulcer of the lesser curvature. Above the con-
striction is a spontaneous communication with a coil of small intestine, and
secondarily with the large intestine in the region of the splenic flexure. At the
post-mortem examination an extensive cancerous growth was found, the stomach
being evidently the seat of the primary lesion. *C.*, *P.*, cardiac and pyloric
portions of the stomach; *S.I.*, small intestine; *U.*, umbilicus. The arrow
points to the spontaneous communication between the small intestine and the
stomach.

It is a significant fact that many of the patients who prove to have
a chronic ulcer of the lesser curvature give, clinically, the classical
symptoms of duodenal ulcer; pain coming on two or three hours after
food and relieved by eating; in some cases pain coming on at 2 a.m.

also (*see* fig. 11A).   No doubt the duodenal distension with congestion
causes these symptoms.   Eating gives rise to pyloric spasm, and so
relieves the tension in the duodenum.   As the pyloric spasm subsides,
allowing the gastric contents to pass through, the distension of the
duodenum again becomes greater, and the pain returns.

IMPORTANCE OF A COMPLETE INVESTIGATION.

Lastly, I would repeat that it is of the first moment that the
radiologist should make a complete investigation of the gastro-intestinal
tract in all cases of gastric ulcer or of pyloric stenosis.   It is no longer
sufficient for him to diagnose the gastric disorder, which is, after all,
merely an end result ; he must bring all the resources of his art to the
elucidation of the primary cause of the gastric disorder, and to a large
extent he will be successful.

The Ætiology of Gastric Ulcer.

By A. E. BARCLAY, M.D.

PERHAPS the title of my paper should have been " The Radiographic
Indications of the Ætiology of Gastric Ulcer," for although one also
attempts to study the clinical, pathological and surgical sides of each
case, that aspect with which we are most in touch will necessarily
assume an importance which may not be shared by those who see the
same conditions from a different point of view.   I am fully conscious of
the fact that radiology does not show microscopic details, but on the
other hand, I claim that it does show gross changes of great functional
significance that cannot be detected by any other means.   These appear
to me of such paramount importance that I have ventured to give to
my paper a title that is perhaps too ambitious, especially when one
considers the extensive literature that there is on the subject.

I would like to clear the ground on one point.   The radiologist
examines cases of chronic indigestion ; he is seldom, if ever, called upon
to examine those cases of ulceration that arise in the course of acute
infective processes and other conditions, and it is only when these lead
to chronic indigestion that he has the opportunity of examining the
patient.   Although these cases eventually lead to chronic gastric ulcer

under certain conditions, they are not, I believe, primarily of the same nature as the ordinary gastric ulcer of which I wish to speak to-night, that, so to speak, just comes by itself, of gradual onset following attacks of indigestion in most cases, giving rise to pain at varying times after food, usually to vomiting and sometimes to hæmatemesis. The ætiology of gastric ulcer is obscure and the number of theories is ample proof that there is as yet no completely satisfactory explanation.

The X-ray method of examination is the only way in which we can obtain information as to the action of the stomach while it performs its functions, for, as we now know, the stomach, as seen in the dissecting room and on the operating table, may be a gross caricature of the organ as it fulfils its functions. After death the vital attribute of tonic action has disappeared, while on the operating table the tone, and therefore the shape of the stomach, are profoundly altered by the anæsthetic. The factors of fear of the anæsthetic, nausea, and vomiting cause such extraordinary changes that those who have had experience will seldom commit themselves as to the size of the stomach that the surgeon will reveal. Those who watch the continuous movement of the stomach during life will hardly recognize the occasional halting and uncertain contractions sometimes seen on the operating table as peristaltic waves.

The X-ray method is the only feasible means of studying the pathology of the living, functioning alimentary tract, and the following observations seem to give very definite guidance towards the solution of the problem of the cause or causes of gastric ulcer.

It frequently happens that an investigation is undertaken with the object of proving or disproving some theory. In this instance I had no theory and no thought of setting myself the task of solving a problem that has foiled pathologists. The theory evolved itself, it forced itself out from the mass of accumulated evidence and called to be set down in black and white. It is impossible to put down the stages by which one arrived at one's conclusions, for they came almost unconsciously, and not step by step, as usually occurs in such investigations.

To give point to the reading of the observations, it is necessary to give an outline of the conclusions arrived at, and briefly stated, the hypothesis is that septic conditions in the mouth or other sources of swallowed septic matter, constipation, mucous colitis, and a variety of other conditions, are capable of producing spasmodic contractions of various parts of the stomach. The spasm may be so severe that

it produces a narrowing of the lumen which from time to time is
of great functional importance, causing a definite obstruction to the
passage of food.   By some indiscretion of diet or want of mastication,
something too large to pass easily through the channel has to be forced
through by powerful peristalsis.   This produces bruising or possibly an
abrasion at the point where the lumen is narrowed, and where there
is the constant irritation of food passing over it.   It is probable also
that the spasm interferes with the blood supply.   Moreover, a surface
is exposed that is not structurally fitted to withstand the action of the
gastric juice.   In this way an ulcer is formed which perpetuates the
original spasm that determined the site of the ulcer.   The ulcer actually
becomes the cause of the spasm and prevents healing, so that even if
the original cause of the spasm is removed there may be little if any
improvement in the local condition.   The chronic ulcer is yet one more
example of the effects of a vicious circle.

The theory that spasm is associated with the ætiology of gastric
ulcer is not new; for instance, in 1853 Virchow,[1] followed by Key,[2]
initiated the idea that spasm or portal stasis might cause hæmorrhagic
infiltrations.   Gerhardt[3] held that erosions might be due to crampy
contractions, but that these very seldom gave rise to chronic gastric
ulcer.   My time is limited, but I cannot pass on without acknowledging
the splendid work that Dr. Charles Bolton has done on this subject.[4]

The multiplicity and varied nature of the observations, original and
otherwise, that I have to record makes it imperative that I should cut
these down to the narrowest limits in order to keep within my allotted
time, and I crave your indulgence if by so doing I fail to make my
points as clear as I would wish, and also for the apparent lack of
continuity.

I may say that this paper arose out of a thesis in which I tabulated
nearly 300 cases with the radiographic appearances and operative
findings.[5]

(1) The stomach is very sensitive, and many cases of marked

[1] *Virchow's Arch. f. Path. Anat. u. Phys.*, Berl., 1853, v, p. 363.

[2] *Hygieia*, Stockholm, 1870, p. 261.

[3] *Virchow's Arch. f. Path. Anat. u. Phys.*, Berl., 1892, cxxiv, p. 85.

[4] Bolton, *Brit. Med. Journ.*, 1910, i, pp. 321, 1221, 1382, 1444; *Proc. Roy. Soc. Lond.*, 1904-05, lxxiv, pp. 135-47; *Quart. Journ. Med.*, Oxf., 1912, v, pp. 429-62.

[5] " The Stomach and Œsophagus—a Radiographic Study," Sherratt and Hughes, Lond. and Manch., 1913.

spasmodic contraction have been met with. Quite a large number of spasmodic hour-glass stomachs have been examined and found at operation to show no trace of ulceration or other abnormality that, by local action, would cause the spasm, and yet, radiographically, they gave all the appearances seen in organic hour-glass contractions. These spasmodic contractions have been met with in the body of the stomach and also at the pylorus. On several occasions I have seen that the vomiting took place from the upper sac of a spasmodic hour-glass contraction, and as soon as the food passed down the tendency to vomit and the pain ceased. The contractions are often present one day, absent the next; they are usually relaxed by massage or manipulation. There is no pain over the site of the spasm on deep palpation. Hertz and I both believed at one time that peristalsis does not occur in the upper sac of a pure spasmodic hour-glass, but this is not so, as my partner, Dr. Bythell, and I now have complete proof to the contrary.

(2) Identical contractions have been met with, in fact, are almost invariably met with, in association with even quite small ulcers; and I have always believed that the severity of the spasm resulting from an ulcer was dependent on its irritability and not on the size of the ulcer, since small ulcers gave just as marked contractions as the large florid ulcerations, indeed in some cases where only a small ulcer was found the food failed to get into the lower sac for hours.[1]

(3) I have seen pyloric obstruction, presumably functional—as proved by seeing the greater part of the food still in the stomach after twenty-four hours—permanently *cured* by removing bad teeth. In another case, an out-patient with many decayed stumps, practically the whole of the food was still present in the stomach after twenty-four hours. On admission he was made to use a tooth-brush, and when I examined him a few days later practically all the food had passed out of the stomach in five hours. He was a fairly intelligent man and had tried careful dieting before he was admitted to the hospital, with no effect.

(4) In two cases I have been so much impressed by the irritable appearance of the stomach that, in spite of fairly well marked clinical evidence, I reported that I thought the symptoms were secondary, the condition of the teeth being, in my opinion, sufficient to cause the

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[1] A slide was shown of the bismuth food still in the upper sac of an hour-glass stomach after twenty-four hours. This was a rather acute case, and at the operation there was complete absence of cicatrization, only an active ulcer of the greater curvature; not a trace of the food appeared to have passed on.

radiographic appearances noted ; this in spite of the fact that some reten-tion of food was noted on one occasion. Clinically, the cases were quite definite, and the surgeon who operated found no evidence of gastric or other intra-abdominal lesion of any kind, not even an adhesion of the appendix.

An irritable condition of the stomach is also frequently noted when there is severe constipation. This is evidenced by the hypertonicity and the active peristalsis, which is of a rather unusual type, as many as four or five waves being noted on the greater curvature at the same time.

(5) Spasmodic contractions, forming hour-glass stomachs, have been noted as being not so marked or entirely absent after the bowels have been moved in cases of severe constipation. The following case is perhaps instructive : There was a very marked hour-glass condition which I thought was due to an ulcer of the body of the stomach, in association with pyloric obstruction. Nothing was found to account for the hour-glass contraction, but the pylorus was thickened and therefore a gastro-enterostomy was performed. I expected that this patient would not be cured, but a year later he writes: " I have put on 2 st. in weight and can eat everything. I was always very costive, in fact, I never had a motion without opening medicine, but have never had a dose since the operation." In the light of other cases it looks as if the operation had not only relieved the pyloric obstruction but also the constipation, and that this latter had been the cause of the spasmodic hour-glass contraction.

(6) In taking brief clinical histories of approximately 1,400 cases I have been impressed with the frequency of a history·of constipation, and also by the presence of bad teeth or a history of having had teeth removed after the onset of the symptoms.

(7) The following observations indicate the transition from an apparently spasmodic condition to a definite organic lesion.

In fully a half of the cases of ulceration of the body of the stomach that I tabulated there was also evidence of retention of food behind the pylorus—i.e., pyloric obstruction—and in the large majority of these latter there was actual thickening of the pylorus. In two cases in which no thickening of the pylorus could be detected at the operation, a gastro-jejunostomy to the upper sac failed to cure, and a subsequent examination showed that a portion of the food had passed into the lower sac and was retained there for twenty-four hours or more. A further operation showed well-marked thickening of the pylorus, and excision of the lower sac cured the patient.

(8) I have just said that in fully a half of the cases of ulceration of the body of the stomach there was also evidence of pyloric obstruction. It is a fact also that in a large percentage of the pyloric obstruction cases there was also noted at the radiographic examination a more or less marked spasm of the body of the stomach. Indeed, the relation between spasm or even ulceration of the body of the stomach and pyloric obstruction is so marked that it can hardly be accidental. It appeared as if lesions in these two sites were dependent on some common cause rather than on one another.

(9) Moynihan put into words a belief that had gradually taken shape in my own mind. "The diseases of the stomach, duodenum, and gall-bladder, with which the surgeon deals are not primary, but secondary." [1] I had been much impressed by what I called the interdependence of abdominal conditions—e.g., when one found an irritative condition of the large bowel, e.g., mucous colitis—one usually found the appearances, and often also the symptoms, of duodenal ulcer, and in one case there was a gastric ulcer with hour-glass contraction. The duodenal appearances and symptoms were also noted in several cases of lesions of the small intestine (carcinoma, tubercular ulcer, and adhesions) in which the actual site of the disease was indicated to the surgeon solely by the X-ray examination. In one of these lesions of the small intestine a typical ulcer of the duodenum was also found, while in another patient, who died a few days after the operation, the mucous membrane was injected and inflamed, although there was no evidence of this on the peritoneal surface (*see* figs. 1 and 2).

(10) The excessive and rapid formation of gastric secretion has been noted in all the later cases in which a pyloric ulcer has been found, except those in which marked retention of food was also present, this feature making it impossible to detect the hypersecretion. Well-marked hypersecretion has been noted in cases where there was slight delay in emptying (six hours), and under medical treatment not only has the delay in emptying disappeared, but also no hypersecretion could afterwards be detected. The hypersecretion seems to be the accompaniment of pyloric and possibly duodenal lesions, and disappears with the pyloric "irritation." I have not yet seen hypersecretion in association with an ulcer of the body of the stomach unless there was an actual lesion of the pylorus also present. In one instance I found what was evidently the upper sac of an hour-glass contraction of cicatricial type

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[1] *Lancet*, 1912, i, p. 10.

(fig. 3), and during the half-hour I had the patient under observation (the surgeon was waiting to operate) only a very small quantity of food found its way through into the lower sac, but there was profuse secretion into the upper sac (fig. 4), and, as suspected, this indicated an active ulcer of the pylorus.   At the operation there was only a very narrow channel connecting the upper and lower sacs, so that the secretion must have been poured out from the cardiac end, strongly suggesting that the hypersecretion of pyloric ulcer is a general secretory activity, probably reflex.

(11) When there is appendix dyspepsia the radiographic appearances are usually those of duodenal irritation, more rarely there is an hour-glass contraction ; and it is a striking fact that in operations for duodenal and gastric ulcer there is so very frequently evidence of old appendix trouble.

(12) Gastric symptoms—the old typical symptom-complex of gastric ulcer—have been cured by short-circuiting the large intestine in a case of severe constipation.[1]

(13) My personal experience of oral sepsis is of interest.   Occasionally when I am below par I have acid risings into my mouth, probably indicating an excessive formation of gastric juice, such as I have frequently noted in marked cases, in association with pyloric ulcer, with "pyloric irritation" in the less marked cases.   On two occasions when I have been conscious of retention of food for a prolonged period—and once I actually brought up a mouthful that contained fragments taken on the previous day—a more thorough and persistent use of an antiseptic mouthwash relieved this unpleasant symptom within the course of a couple of days.   Occasionally I am also troubled with hunger pain.   I am certain I do not suffer from any gastric lesion, for I have perfect health in the ordinary course of events, and do not know what indigestion is.   This experience is by no means uncommon I find ; slight loss of appetite, sense of weight in the stomach for hours after food, burning sensations, acid risings and waterbrash, that are quickly relieved as a rule by sodium bicarbonate.   In nearly all these cases it is the teeth that are at fault.   A doctor was telling me of this trouble a few days ago, and I inquired as to his teeth and found that he had had false teeth for rather more than a year and, when he came to think of it, since his teeth were removed he had not needed a single dose of his sodium bicarbonate bottle, which he always kept on his dressing-table, and used to resort to frequently.

[1] *Lancet*, 1913, i, p. 418.

F‌IG. 1.

Small and very hypertonic stomach, with active peristalsis, emptying rapidly, and food shadow seen in duodenum. (Typical marked duodenal irritation picture). Note the food shadows seen beginning to collect in the small intestine. Plate taken ten minutes after the food was given. **X** is the umbilicus.

F‌IG. 2.

Same case as fig. 1, but twenty minutes later. Stomach nearly empty and all the food collected in the jejunum. This turned out to be an early carcinoma of the jejunum, and the post-mortem showed an infected and inflamed duodenum but no actual ulcer. **X**, umbilicus.

(14) The experimental production of gastric ulcer in animals shows that these always tend to heal very rapidly, and a typical chronic ulcer has not yet, I believe, been produced, except by causing stasis or local thrombosis.

(15) I have seen no case in which ulceration has taken place at the site of a gastro-enterostomy opening, and yet at this point the mucous membrane is comparatively roughly joined, and one would certainly expect that if ulceration was caused by the action of the gastric juice this would be a very common sequence to the operation, especially when we remember that in most of the operations a clamp is used that must produce a certain amount of bruising, also that in a certain proportion of cases the operation fails because of the formation of adhesions beyond the stoma which cause obstruction. This is certainly not the case in the hospital with which I am connected, and it is inconceivable that the mucous membrane is brought into perfect apposition in every case.[1]

(16) In the duodenum the conditions do not appear to be exactly the same as in the stomach. Dr. Hertz's observations and my own show that in every case of duodenal ulcer, also where there is duodenal irritation, the stomach begins to empty itself very rapidly unless there is obstruction, and one can easily see quite large shadows pass through the duodenum. In some cases there is a separate bolus persistently present in some part, as if a pocket was formed; but in spite of large quantities passing through I have very seldom observed obstruction, and whenever this has been seen there has been more or less cicatrization or some external cause found at the operation to account for the retention. It seems, therefore, as if spasm, as seen in the stomach, is not associated with duodenal ulceration in the same way, and I think it likely that some other influence is at work in these cases. The conditions that obtain in the stomach and duodenum during life are as yet only partly understood, and the various factors that control the passage of the food through the pylorus are by no means clear. Before the Anatomical Society I gave my reasons for believing that the control of the pylorus was influenced by the duodenal condition. In all cases of duodenal ulcer and of duodenal irritation one sees very abnormal pyloric relaxation resulting in the passage of large masses of food, whereas in

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[1] Neither the pathologist nor any of the surgeons at the Manchester Royal Infirmary have seen a single case of ulcer occurring at the site of the stoma (gastro-jejunal ulcer), nor have they seen a jejunal ulcer. The only case of ulceration occurring in this region was an acute ulcerative process that almost separated the jejunum from the stomach, but this was four years after the operation had been performed.

FIG. 3.

Upper sac of hour-glass stomach. Plate taken five minutes after the bismuth food had been given. Note the thin clear fluid between the air-space and the bismuth food—this was all secretion poured out on top of the bismuth food, the upper sac having been quite empty before the food was given. **X,** umbilicus.
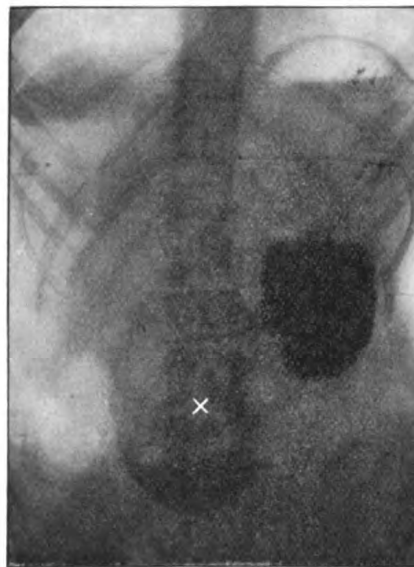
FIG. 4.

Same case as fig. 3, but twenty minutes later. Note the **very large** increase in the quantity of secretion that lies between the air-space and the bismuth. Below the umbilicus **(X)** some food can be seen in the lower sac.

the normal subject it is practically impossible to see the food passing through the duodenum, so fine is the stream that passes through the pylorus, and so rapid the segmentation and shredding of the food. The appearances suggest that the segmentation contractions that normally shred the food in the small intestine are absent in the duodenum when there is ulceration or irritation, otherwise the large shadows would not be seen in the duodenum. We know that the pylorus is abnormally relaxed in these cases, and one suspects that the relaxation extends to the duodenum and that the relaxation is sufficient to counterbalance whatever tendency towards spasmodic contraction the ulceration might give rise to. The absence of a spasmodic contraction in these cases would account for the fact that they so frequently heal spontaneously. The causation of these ulcers, however, does not appear to be the same as in gastric ulcer.

Taking all these observations together, I think that they become intelligible on the following hypothesis: The stomach and duodenum are, as it were, the storm centre for the alimentary tract to which peripheral stimuli are referred, the result being either a general irritable condition of the stomach and duodenum, or more frequently spasmodic contractions of one or more parts of the stomach. Presumably some of these stimuli are referred to the stomach and duodenum directly from swallowed septic matter. Others are referred indirectly from lower parts of the tract, as in the case of lesions of the small intestine, where we have the radiographic indications and also the operative proof of the occurrence of trouble in the duodenum in·association with lesions situated in the jejunum or ileum. In fact, whenever I see marked duodenal irritation I am always on the look out for indications of a lesion in the small intestine. Again, in the mucous colitis, constipation and appendicitis cases we have both clinical and radiographic evidences of functional disturbances in the stomach or duodenum, and the subsequent history of the cases has shown that the patient could be cured and that these radiographic indications would disappear by treating a lesion that was apparently far removed.

Now these spasmodic contractions may give rise to all the radiographic appearances of actual lesions—on several occasions a surgeon has reopened the abdomen at my suggestion, because of the persistent hour-glass contraction that has been noted above the stoma of a gastroenterostomy, which was functioning perfectly but had not relieved the symptoms. Three of these patients were actually observed vomiting from

the upper sac of the hour-glass contraction, the pain and tendency to vomit disappearing when once the food had passed down into the lower sac, and yet no cause could be found at the operation to account for the contraction. In several cases where I have reported definite pyloric obstruction the surgeon could find nothing to indicate gastro-enterostomy, and in two of them a subsequent operation showed thickening of the pylorus. There are many cases of various types all pointing in no uncertain manner to the obvious conclusion that the spasmodic contraction is of as great importance, functionally, as the organic; and that these apparently purely spasmodic contractions are replaced by actual organic lesions has been noted in two cases in which a second operation has been undertaken, the pylorus being found quite normal at the first operation while subsequently well-marked thickening was noted.

That ulcerations of the alimentary tract are irritable and give rise to spasmodic contractions has been proved time and again— e.g., an ulcer of the œsophagus that only caused symptoms (and obstruction) after the patient took dry breadcrumbs. (The ulcer was actually seen through the œsophagoscope afterwards.) The same has been noted in the stomach on many occasions. Hour-glass contractions with retention of food in the upper sac have often been found, at operation, to be due to quite small ulcers with practically no cicatrization.

My thesis is that the original contraction causes undue obstruction to the passage of the food and that perhaps indiscretions of diet lead to bruising or even abrasions of the mucous membrane. The persistence of the spasm, aided by the action of the gastric juice and the mechanical irritation of the food, leads to the formation of an ulcer—the symptoms being probably more severe than usual during the attack. The raw ulcer is irritable and capable of reproducing or accentuating the spasm that originally caused the lesion. It follows that when once an ulcer is formed it will perpetuate the spasmodic contraction even if the primary cause of the spasm is removed. Hence it is clear that removing the primary cause will not cure the patient, for the ulcer when once formed continues to induce a spasm that tends to the perpetuation of the ulcer. If, on the other hand, an ulcer has not formed, the removal of the primary cause, whether it be teeth, nasal discharge, or swallowed pulmonary discharge, stagnation of fæces, appendix inflammation, or some other source of infection, will probably bring about a rapid and lasting cure of the patient.

To what extent the gastric juice is responsible I cannot say, but it seems reasonable to suppose that Dr. Bolton's excellent work is correct,

and that when once an abrasion is formed a surface is exposed that is not adapted to withstand the action of the gastric juice and will therefore tend towards the extension of the ulceration.

Since this conception of gastric ulcer came to me I have applied it as far as possible in radiographic practice, and in nearly every case found one of the various factors at work. Speaking very roughly, it is usually constipation in females in association with ulceration of the body of the stomach, while in males one more often found bad teeth in association with pyloric obstruction.

It is very highly probable that this theory does not cover the whole ground, and that there are many other causes than those I have mentioned—e.g., infective ulcers that are said to be multiple. I mention this lest I should give the impression that I believe this theory covers the whole subject. I stated in my opening remarks it is the radiographic aspect on which this paper is based, and a theory such as this can only be proved by clinicians.

If we accept this theory, has it a practical bearing ? Most emphatically, yes, and it applies even more to general practice than to consultation work, for the general practitioner sees the case in the early stages. In every case of indigestion a thorough search must be made for any possible source of irritation or infection both in the alimentary tract and in the other systems of the body. The teeth must be carefully examined and no decaying stumps left to pour their discharge direct into the stomach. Fixed bridges, that nearly always harbour putrefying foodstuffs, should be cleared out and replaced by a more sanitary system of artificial teeth. Disease of the accessory sinuses, constipation, colitis, and all possible sources of septic absorption, must be attended to. It is the *fons et origo* that we must endeavour to locate. The treatment of indigestion must be attacked at its source ; and because we happen to relieve the patient by a dose of medicine that gets rid of the symptoms we must not be content, for unless the cause is removed there will be recurrence after recurrence, and we are all well acquainted with the result—the sad and depressed individual, of gloomy outlook, whose dietary is a problem and whose life is a burden.

DISCUSSION.

Mr. THURSTAN HOLLAND showed a number of slides bearing on the subject. He said it would be interesting to know whether intestinal stasis preceded the stomach symptoms, or vice versa ; because he was sure that in some of the cases of which he had shown the skiagrams there was no stasis whatever. If stasis was the cause of the symptoms of gastric ulcer and the hour-glass contractions, why was it that simple gastro-enterostomy into the upper segment would frequently cure the patient ? Every surgeon would admit having operated upon cases of hour-glass contraction—doing a posterior gastro-enterostomy into the upper segment—and the patient had been cured. He felt sure that in many cases the pylorus was quite patent and normal. In some cases gastro-gastrostomy was done, and the patient gained in weight and got well, and nothing more was heard of him, though probably more would be heard if he did not remain well. Dr. Jordan seemed to think that cancer often occurred on top of old chronic gastric ulcers, but in a series of twenty-five cases when the latter condition had gone on to hour-glass contraction there had not been malignant disease in any one.

Dr. JORDAN said he was pleased to find there was not, after all, much essential difference between Dr. Barclay's results and his own. Such differences as existed were, as Dr. Barclay had suggested, due to differences in technique. He considered that radiologists should be able to report on the duodenum in a routine manner in all cases, describing it as normal when it was so, and reporting on all degrees and kinds of abnormality. There was now a great demand—rapidly growing—among physicians and surgeons, for trust-worthy information concerning the duodenum in their patients, and it was for radiologists to supply that information. As already stated in his paper, he was able to distinguish with the greatest certainty between the normal duodenum and the distended duodenum as it occurred in the subjects of intestinal stasis. Sir Berkeley Moynihan, in the latest edition of his book, gave as his opinion that too much had been made of " supposed " dilatations of the duodenum. He regarded the duodenum as being normally " a large inert mixing chamber."[1] This was a significant admission, showing that Moynihan has come to regard the dilated duodenum as the normal, in consequence of the very large proportion of cases of duodenal disease included in his operative practice. As to Moynihan's opinion that the duodenum is inert, he would soon modify that

[1] " I believe that too much is made of these supposed (duodenal) dilatations. The duo-denum is a mixing chamber wherein the chyme ejected through the pylorus is made to mingle with the bile and the pancreatic juice. The contractile power of the duodenum is, I believe, small, for though eager waves of contraction can be seen in the pyloric part of the stomach and in all parts of the jejunum and ileum, they are extremely rare in the duo-denum. The duodenum is normally, in my experience, both large and inert."—Moynihan, " Duodenal Ulcer," 2nd ed., 1912, p. 136.

view if he were to observe the duodenum, well filled with bismuth, as it appears on the fluorescent screen. Mr. Thurstan Holland's series of lantern slides was very interesting; they showed gastric ulcers as they appear in the vertical examination, and this accounted for the differences between Mr. Thurstan Holland's pictures and his own. The night-cap-like projection which he (the speaker) had. pointed out was shown beautifully in Mr. Thurstan Holland's pictures, but filled with air instead of bismuth. As he had stated in his paper, the hour-glass constriction due to a chronic ulcer of the lesser curvature passed off completely under a general anæsthetic; if any constriction remained it was due to cicatrization (partial or complete) of the ulcer. Mr. Thurstan Holland had asked why patients with organic stenosis at the pylorus were cured by the operation of gastro-enterostomy. He replied that these patients had been suffering under a great disability, perhaps for years, for they had been deprived of intestinal digestion, since the food was unable to get out of the stomach. If a free opening were then made from the stomach into the small intestine the patient would begin to gain in nutrition at once, and he was the last to deny that the results of gastro-enterostomy were very good in cases of organic stenosis. His experience made him equally sure, however, that the cure was not complete; scarcely a week passed without some patient being sent to him for investigation on whom this operation had been performed with success. The patients returned because they presented all the signs and symptoms of intestinal stasis, and he was always able to give positive proof of the existence of stasis in these subjects. The fact was becoming recognized more and more widely that gastric and duodenal ulcers were end-results. Surely, then, the most important work for the future consisted, not in curing these ulcers by operation, but in preventing their occurrence by recognizing, sufficiently early, the primary condition to which they were due. The radiologist should detect the presence of intestinal stasis in its earliest stages, so that early measures might be taken to combat it. The duodenum was the most sensitive part of the alimentary tract, and its distension was one of the earliest and most constant signs of intestinal stasis.

Dr. BARCLAY said that he did not agree with Dr. Jordan's views on several vital points and he did not think it was likely they would come nearer agreement by arguing from the platform. He believed that Dr. Jordan did not have the patient's bowels cleared out and that they had an ordinary meal which was followed by a huge dose of bismuth. Then if the ordinary food was in the small intestine the bismuth food would be held back and there would be artificial distension of the duodenum. The same would occur at the ileo-cæcal valve if the patient's large intestine was not empty in front of the bismuth meal, for it was highly probable that the cæcum was filled simply by propulsion of food from the ileum. He confessed that he was rather tired of hearing of intestinal stasis due to kinks which he could not himself demonstrate except by omitting to clear out the bowels before the examination. In every case where he had seen the described appearance of kinking it was due to old appendix trouble or other adhesions. He thought that if in order to show

these kinks it was necessary to have the large intestine filled by stagnant faeces (as must be the case in constipation when the patients were not prepared) the common sense deduction was that the cause of the trouble was beyond the alleged kink through which the stagnant food must have passed days before. In the hour-glass stomachs, although the contraction was always towards the lesser curvature, it was not by any means always that the base of the ulcer was on the lesser curvature as Dr. Jordan had suggested and demonstrated. The ulcer gave rise to a spasmodic contraction, a ring of contraction, and no matter where the ulcer was situated the organ always contracted towards the lesser curvature simply because this was the thicker and more fixed part. Of course, when adhesious occurred and the base of the ulcer became adherent this became the most fixed point, and he had seen a considerable number of cases in which the channel had been from the posterior wall and even from the greater curvature. He did not think that carcinoma of the body of the stomach was a frequent sequence to chronic gastric ulcer, as Dr. Jordan had suggested. He had recently tabulated a large number of cases [1] and found under ulceration of the body of the stomach that out of forty-seven cases thirty-nine were females, while in the cases of carcinoma of the body of the stomach only eight out of twenty-four were females, figures which he thought indicated that only a very small number of these cases took on malignant growth; otherwise his figures must surely show that carcinoma of the body of the stomach was far commoner in the female than in the male, whereas the direct opposite was the case. At the pylorus, however, carcinoma seemed to be of about equal frequency in the two sexes. He would like to talk over with Dr. Jordan the question of duodenal ulcer. He knew duodenal irritation when he saw it, also duodenal ulcer. Four years ago he started to diagnose the latter, and he had done so successfully in many instances, but he could not be certain of the diagnosis between irritation and ulceration. In one case where he had said the duodenum was perfectly normal, the operation had revealed grey patches on the duodenum, and in the very next case when a similar report was given the surgeon again said there was a duodenal ulcer present, but the patient died from haemorrhage three days after the operation, and the haemorrhage was apparently that of duodenal ulcer. No duodenal ulcer or remains of an ulcer were present and no cause could be found for the haemorrhage, although there were plenty of patches on the duodenum. Even surgeons were not infallible, and radiographers had to check their findings by those of the surgeon. He certainly held no brief for the infallibility of the radiologist.

He agreed with Dr. Jordan that the stomach and duodenum were the most sensitive parts of the alimentary tract, but he did not think that intestinal stasis played such an all-important rôle in the aetiology of gastric ulcer. Until he knew more of the normal stagnation of faeces in the large intestine, of the pathology or more likely the physiology of various peritoneal folds and

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[1] "The Stomach and Œsophagus," Sherratt and Hughes, 1913.

M—8*b*

adhesions, he preferred to speak of constipation; for the contents of the large intestine were always in a state of "intestinal stasis," except for some few sudden on-rushes occurring a few times during the day.

Mr. THURSTAN HOLLAND, in further remarks, said, in reference to ileal kinks, and their demonstration, the technique was as follows : One must not open the bowels, by medicine or enemata, for at least two days before giving the bismuth meal, which meant that there was two days' food inside the person before the examination, and presumably it was in the ascending colon, transverse colon, and descending colon, because they were cases of chronic stasis. Dr. Jordan said that after this two days' filling up one must give them their breakfast, and then their bismuth food, and then the ileal kink could be demonstrated. Did not that mean that the food was prevented from getting into the ascending colon because it was full, and the bismuth food was dammed back in the last coils of the ileum ? If the ileal kink was the cause of the symptoms, and the cause of the stasis, surely it should be demonstrable, whether the colon was or was not full.

Dr. JORDAN, in reply, said that all his patients were examined in the same way; if his results were due to his method, and did not represent pathological conditions, then all patients, normal as well as abnormal, would present these appearances, and his results would not be substantiated (as they were) at operations. His results were perfectly consistent, and he was able to distinguish, with the greatest certainty, between the normal duodenum and that seen in stasis cases, and between the normal end of the ileum and the same part as it occurred in stasis. An ileal kink was an anatomical condition, and could not be demonstrated with any certainty in patients whose bowels had been previously cleared by purges and enemata.

Electro-Therapeutical Section.

May 16, 1913.

Dr. REGINALD MORTON, President of the Section, in the Chair.

Case of Recurrent Carcinoma.

By S. GILBERT SCOTT.

THE patient, a woman, aged about 40, had carcinoma of the mammæ, and had since developed recurrent subcutaneous nodules all over the body, some of those on the abdomen being the size of a walnut. At the meeting of this Section, recently held at the Middlesex Hospital, Mr. Scott had said that, in these cases, although the nodules disappeared under X-ray treatment, the patient, as a rule, did not live more than two months after the nodules began to extend, for it was found impossible to keep pace with them. But this case illustrated an exception.

History of the Case.—September, 1909: Left breast removed for carcinoma. December, 1911: Lumps in right breast noticed; shortness of breath first noticed. February, 1912: X-ray treatment begun. November, 1912: X-ray treatment stopped; patient very ill; great dyspnœa; nodules rapidly increasing. December, 1912: Many nodules on head, abdomen, neck, and chest. January, 1913: Vomiting; very little nourishment could be taken. February, 1913: Nodules getting smaller; patient better. March, 1913: Some of the nodules disappeared; eating heartily; walked with assistance; no dyspnœa; gaining 1¼ lb. per week. April, 1913: The only nodule remaining was behind the right ear, this getting smaller; lumps in right breast smaller; still gaining weight.

As the nodules did not begin to disappear till four months after the last X-ray treatment he could scarcely arrive at the conclusion that it was a cure by the rays, and it was therefore probably one of the cases of spontaneous cure which were heard of but seldom seen.

JU—4

DISCUSSION.

Mr. DEANE BUTCHER did not think Mr. Scott should decline to attribute the cure to X-rays ; he would himself claim it as a cure by X-rays.   If ill-effects which ensued months after the use of X-rays were to be attributed to the effects of the rays, it was reasonable to invoke their influence when the effect was good and the period long.   Such cases as the present one were continually being reported, especially from abroad.

Dr. FRANK FOWLER said he thought the case illustrated the great import-ance of prophylactic treatment in every case of cancer of the breast.   It was not justifiable to withhold any possible benefit which the rays might confer in preventing local recurrences ; in many cases such recurrences could be prevented, the hopeless cases being, of course, those in which recurrence was in bone or liver, or other deep viscus.

Dr. HARRISON ORTON asked whether a microscopical examination was made of a portion of the original tumour which was removed.

Dr. FRED. BAILEY remarked that the skin of this patient appeared very little affected considering the amount of X-ray treatment given.   In similar cases of recurrent nodules which he had treated at intervals during three or four years, the X-rays left the skin in a very different condition from the skin of this patient, there being finally considerable atrophy, pigmentation and dryness, although no definite erythema had ever been produced.

Mr. GILBERT SCOTT replied that the growth was proved to be carcinoma. He gave $1\frac{1}{2}$ Sabouraud, measured, on the tube side of the filter, at the ordinary standard distance, and filtered through $\frac{1}{4}$ mm. of aluminium, using a high tube.   He used that dose when trying to treat both subcutaneous and deeper structures.   That thickness of aluminium sufficed to prevent dermatitis.   He gave this dose twice a week for six weeks on the scar, after which she had a month's rest.   The subcutaneous recurrent nodules could usually be made to disappear with one dose of the rays.   The last time he treated her when her case seemed so hopeless, he felt certain, from the difficulty in breathing, that enlarged glands at the root of the lung were pressing on the bronchus and causing the noisy respiration.   The prognosis seemed as bad as it could be, yet she recovered.

Case showing Favourable Results of Treatment of Suppurating Tuberculous Glands by X-rays.

By E. P. Cumberbatch, M.B.

The patient was a girl, aged 16. Five years ago the glands in the neck first appeared, and a year later they were much larger, and had commenced to suppurate, and sinuses formed. They were first treated with fomentations, unguents, and other local applications. X-ray treatment was commenced in May, 1911. The mother said that improvement set in at once and no more glands became enlarged, and no fresh sinuses formed. The discharge also lessened, and the swellings became smaller. Dr. Cumberbatch saw her first in October, 1911, and the improvement was then steadily progressing, the neck getting smaller in circumference, and the glands were less palpable, and the sinuses had closed. She received the last application in July, 1912; her weight had increased, and she now looked very healthy. The neck was not swollen, no glands were palpable, the sinuses had closed, and there were left only some scars on the skin marking the site of the former abscesses. The dose which she had averaged $\frac{1}{4}$ pastille (Sabouraud B) per week on each side of the neck. Dr. Cumberbatch felt justified in saying that this great improvement was the result of the irradiation; he noted the diminution in size of the neck dose by dose.

Dr. Norman Aldridge thought the good results which followed X-ray treatment of tuberculous glands ought to be better known. During the last five years he had treated a large number of cases by this means, and he did not think there was one which was not greatly improved—he had seen them again after considerable intervals. One such case he had in mind in which only one side of the neck was affected. With treatment the glands went down, all except a small nodule. This patient and another of the same age (16) came some time afterwards with enlarged glands on the other side of the neck, and the side originally treated was found to have remained quite sound. Exophthalmic goitre and tuberculous glands were the two conditions in which X-ray treatment was most favourable.

JU—4*a*

Cases of Exophthalmic Goitre treated by X-rays.

By W. M. KINGSBURY.

FIVE patients who had been treated by means of X-rays for exophthalmic goitre were shown. The dosage varied from a full pastille to half that quantity. The first was that of a policeman who had the disease severely when first seen—exophthalmos, tremor, and considerable palpitation. His illness started three and a half years ago, and he was laid by nine months, and later had five months' absence from duty. He came to hospital in April, 1912, and was kept in bed three or four months. He had a dozen pastille doses at three-weekly intervals. Last September he went back to duty, and had remained well ever since. His pulse was now 68.

The next patient, a man, had seven pastille doses. He had all the signs, and his pulse was 100; it was now 60. There was no tremor, the thyroid was still somewhat enlarged, but that was the only remains of the disease.

The remaining three patients were females; one of them was now practically well, and the others were much improved. The first of these, when she came to hospital, had considerable difficulty in breathing, marked tremor and palpitation, pulse 132, and exophthalmos. She now had practically no tremor, the thyroid was smaller, and the pulse 68.

The next patient had had nine pastille doses, and had been in hospital twelve weeks. She was now so well that she helped her mother daily. Her pulse had been 168; it was now 120. Her eyes were now not so prominent, and her neck girth had diminished 1 in.

The last patient had had eight pastille doses. She had not had exophthalmos, but was very excitable, and at times became depressed. There was a symmetrically enlarged thyroid, and a rapid pulse. The pulse was now 88, and there was but little tremor remaining.

Treatment of Exophthalmic Goitre by X-rays.

By W. Ironside Bruce, M.D.

Dr. Ironside Bruce gave an analysis of eighteen cases of exophthalmic goitre which had been treated at Charing Cross Hospital since 1905, and he acknowledged his indebtedness to Dr. Lindsay Lock. Six of the eighteen did not appear for re-examination, and one had died, in which case only three exposures had been given when diphtheria supervened. The remaining twelve were examined three months ago, and they had been divided into three categories : (1) cured; (2) greatly improved ; (3) improved. Four were cured ; the exophthalmos and goitre had gone, and no symptoms remained. Five—of which one had been operated upon—were greatly improved. Three had improved, and one of these also had been operated upon, two still remaining under treatment. The exophthalmos disappeared in four cases, was slight in three, and marked in five, two being still under treatment. The skin was normal in seven cases, there was slight telangiectasis in four, marked telangiectasis in one. These latter were his earliest cases, and the number of exposures given was much greater than had been since found to suffice. All the patients expressed themselves as much better, and they stated that their weight had increased. In none of the patients was there any sign of myxœdema ; and that was of interest, since in a case he recorded some years ago, in which he thought myxœdema had developed, the patient got very fat at the latter end of the treatment, which lasted two years, and the hair over her forehead began to fall. When Dr. Lock saw that patient three months ago her appearance was normal, no sign of myxœdema being noted. All his cases were treated with the X-ray tube at a distance of 18 to 12 in. from the skin, the surrounding part being screened off by a 4-in. thickness of felt. They had attended either two or three times a week for periods varying up to two years. The effect of the treatment was wonderfully good. But he had always tried to have in mind the fact that cases of exophthalmic goitre had been known to recover without treatment, so that one must somewhat discount the value of the X-ray treatment on that account.

DISCUSSION.

Dr. HUMPHRIS said that when this subject came up for discussion at the last Electro-Therapeutical Congress in America, much attention was devoted to the question of electrical stimulation of the region of the sixth and seventh cervical nerves in exophthalmic goitre. By such stimulation of these centres he had obtained good results in reduction of symptoms, but not reduction of the goitre. Dr. Arnold Snow said, in her last book, that she brought about a large reduction of pulse-rate by this means, and by abdominal vibration in a large number of cases. He (the speaker) many years ago used an interrupted faradic current, with a plate on each side of the thyroid, and got good results. He believed this disease was peculiarly suitable to electro-therapeutical treatment, even apart from X-rays. In one case, however, there was no reduction of the gland even after two years' treatment. But her palpitation was practically gone, although at one time it was so bad that she was likely to lose her situation, that of lady's maid. And she had had as large a dosage of X-rays as it was thought prudent to give her.

Dr. FRANK FOWLER said the association of myxœdema and Graves's disease was interesting, and he was encouraged by Dr. Bruce's experience that the œdema passed off. He thought the thymus should be included in the irradiation, and he was not afraid to ray the whole of the thyroid.

Dr. G. B. BATTEN said he treated a case of Graves's disease by means of X-rays in 1908. He applied the rays to two-thirds of the thyroid seventy-five times, using a dose of two-thirds of a pastille through four thicknesses of carpet felt. There was no burning ; the thyroid gradually became smaller. The rays were applied through a hole in opaque rubber. He left one-third of the gland untreated to prevent the chance of myxœdema supervening. The patient was not absolutely cured of all her symptoms.

Dr. DONALD BAYNES agreed with Dr. Humphris that very good results could be procured in this disease without using X-rays ; he had never used X-rays for Graves's disease, but other modalities, which gave very good results ; concussion applied to the seventh cervical spinous process gave excellent results.

The PRESIDENT (Dr. Reginald Morton) said that exophthalmic goitre could be placed alongside tuberculous glands as offering excellent results from irradiation. He had never had any trouble in the matter of overdoing the dosage or frequency, perhaps because he believed in moderate doses, and was very cautious in that regard. That also diminished the likelihood of telangiectasis.

Demonstration of "Duralumin."

By Stanley Melville, M.D.

Dr. Stanley Melville exhibited a number of radiographic prints, and splints designed especially for orthopædic work, made of the new
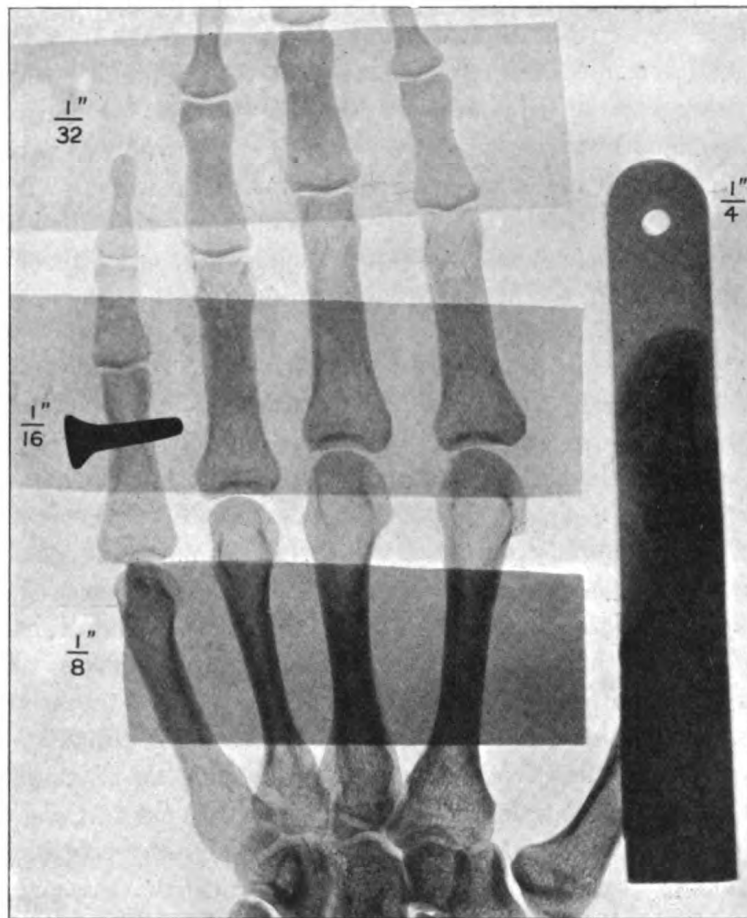
Skiagram taken through varying thicknesses of the metal.

alloy of aluminium and magnesium, termed "Duralumin," invented by Messrs. Vickers and used in the construction of their airship. It permitted the transmission of X-rays, and hence the wearing of a splint made with the metal did not prevent a skiagram being taken of the part. Its strength was equal to that of mild steel, but it was only

one-third the weight. Heating would not temper it, but hammering would. Mr. Muirhead Little, of the Royal National Orthopædic Hospital, made some interesting experiments with the metal from the point of view of surgical appliances. After immersion in strong salt water for three months the metal was as good as ever. Strong acids, and therefore acid perspiration, did not affect the metal, but caustic alkalies quickly produced disintegration. The pelvic band of steel which it had been the custom to use to strengthen the plaster of Paris after reduction of a congenital dislocation proved a great nuisance to the radiographer, but duralumin would obviate that difficulty while in no wise detracting from the strength of the support. Moreover, there was now no need to take a fracture down to see how it was progressing, as a skiagram could be taken with the splint in position. An ordinary valgus plate of the metal showed no shadow at all. The skiagram reproduced (*see* figure) would suggest that an interposed sheet of duralumin, $\frac{1}{8}$ in. or $\frac{1}{16}$ in. thickness, actually intensifies the image.

A New Apparatus.

By REGINALD MORTON, M.D.

It is very generally admitted that the ordinary induction coil as used in medical treatment and diagnosis is a very unscientific instrument notwithstanding its usefulness. This arises from the fact that we seldom know the exact character of the current given off by any particular coil, and that it is impossible to reproduce any given set of conditions when and where desired. To meet this difficulty I made, as far back as 1903, a revolving commutator with an adjustable brush, as suggested by Leduc, but so modified that the current was reversed as well as interrupted. This practically got rid of any possible accumulation of electrolytic products, and also increased the tetanizing effect. By means of the shifting brush the length of the alternating impulses could be varied from 0 to 0·5, so that at the maximum each impulse was followed by an equal period of rest before reversal took place. Long impulses are painful without having any corresponding advantage. A very useful proportion of period of impulse to period of rest is about 1 : 10. The current from the battery or other source of supply passes through the milliamperemeter before reaching the commutator; this gives us the mean value of the current passing. I have satisfied myself

that this current is as useful as that from a coil for most purposes, and with similar instruments any given set of conditions can be reproduced by anyone and at any time. With the introduction of the condenser method of testing, so beautifully demonstrated to us in January by Dr. Lewis Jones, there would seem to be less reason than ever for the retention of the induction coil in scientific work of any kind.

There is another device used in the application of electricity that has become very popular during recent years, and that is the rhythmic interrupter. The use of this instrument has very greatly enhanced the value of electrical treatment, and the more I use it the more I like it. Most of the bodily functions are performed in a rhythmical manner, and it seems but natural that electrical applications should be made in a similar way.

Being somewhat dissatisfied with the progress of a case of arthritis I was treating by ionization, it occurred to me that if I passed the current through the rhythmic interrupter it might do better. While in the laboratory it is true that the number of ions transferred depends on the current density and the time, there was the possibility that a high current density might give rise to a sort of tetanic condition in a living membrane such as the skin, that would not be favourable to the best results. However this may be, the effect on the case in question was quite marked, improvement synchronizing with the change in the method of application. I have tried it on a few other cases with equally encouraging results, and I cannot help feeling that this modification may be of some value in ionization. I believe it to be worth experimenting with, and if some others will join me in this we may be able to arrive at some decision regarding it.

The rhythmical variation should be a very slow one—a complete cycle in not less than about six seconds—and the dipping needle so set that the current is just not cut off. I have not yet decided whether the needle should be bare or insulated to near the point; the tissues will get more rest in the latter case but the ionization may not be so efficient.

These two valuable adjuncts to electrical treatment with constant or variable currents may easily form a permanent part of the apparatus, and I have here a rough model which answers its purpose admirably. The current after passing through the meter is led through terminals to the common points of a double pole two-way switch. This latter enables us to pass the current through the commutator or not, as desired. The wires then lead to terminals on the other side of the board to which the patient is connected, one of the wires taking in the

rhythmic interrupter on the way; a short-circuiting switch places the latter device out of action when not wanted. It thus follows that these two instruments may be used in combination, singly or not at all, when the constant current only is required. It is also arranged that though driven by the same shaft the speed of either may be varied independently of the other. For very exact work a speedometer may be attached, so as to indicate the periodicity of the alternating impulses. This commutator gives two complete cycles per revolution and a scale and pointer indicates the length of the impulses relatively to the periods of rest. With a variable resistance in the motor circuit the periodicity may be varied within wide limits; the rhythmic interrupter is driven from the opposite end of the same shaft by means of a friction wheel acting on the face of a copper disk, the speed varying with the point it engages between the centre and periphery of the latter. It is not necessary for me to dilate on the advantages of such a combination as this. I think I have provided for all practical requirements, but I shall highly value any criticisms that may be made.

Dr. BATTEN expressed his interest in the President's exhibit because Dr. Morton invented his rectifier at about the same date as he (Dr. Batten) invented another, and adapted his rectifier for this kind of purpose. It made contacts with silver studs on each side, and the current passed through lamps. It picked out a little of the sine curve, either on one side or on both sides. One could use either the sinusoidal or unidirectional interrupted current, and the voltage could be altered. But at that date it was not proceeded with.

Case for Diagnosis.

By G. B. BATTEN, M.D.

DR. BATTEN showed a skiagram of a case on which he asked for opinions. The patient was a gardener, aged 64. Most of his life had been spent in the open air, but he stoked furnaces for greenhouses. Last July he examined the man, and found the right side quite dull, but there was a small area of resonance in the right apex, close to the middle line. The sputum did not show either tubercle bacilli or pneumococci, though there were some staphylococci. He had had a little jaundice, and his heart was weak. The skiagram showed a clear space high up on the affected side, all the rest of the right lung was very dense. Dr. Batten did not believe it was fluid. The heart was not displaced. The patient was still in the same condition at the present time.

DISCUSSION.

The PRESIDENT believed it was a case of new growth, though not carcinoma, because of the well-defined edge. The triangular area he considered to be normal lung. When he was at the London Hospital there was a case which appeared exactly like this. Treatment by X-rays was suggested, but after one or two applications the patient kept away, for family reasons.

Dr. FRANK FOWLER thought it likely the case might be one of new growth and fluid as well; such a combination was not uncommon.

Dr. BAILEY said he had lately seen a woman, among his out-patients, who bore a large depressed scar over the liver, the result of an operation for hydatids when a young girl. She had never been out of England. There was a history of a favourite dog who played with them in childhood in the nursery, and it was suggested that the dog was the host of a *Tænia ecchinococcus*, and that the nursery floor became infected with ova.

Dr. IRONSIDE BRUCE did not think malignant disease of the lung would show an even distribution such as this skiagram revealed. It must be, in his view, either a collection of fluid, or an endothelioma growing from the pleura, which had invaginated itself into the pleural cavity.

Mr. GILBERT SCOTT said he remembered the case of a woman who came to hospital with complete opacity on one side, except in a triangular patch such as seen in the present skiagram. It was homogeneous and dense. She was in hospital several weeks, and then a large aneurysm was revealed. It had pressed on the root of the lung, there was no air entry, and she also had pleural effusion. She was between 40 and 50 years of age, and before she left the hospital the lung trouble had disappeared. In the early stage the whole condition had been masked by the fluid. The upper border was formed by the aneurysm, which gave the impression that it was a solid growth.

Case of Arborescent Burning by Lightning.

By C. WARD, F.R.C.S.I.[1]

ABOUT Christmas two years ago, the patient, " Gaudud," a Zulu lad aged about 18, was leading the first two of a team of ten mules drawing a farm wagon near Vryheid (he was a voerlooper, a leader of mules or oxen). A dry storm was threatening ; there was no water nor trees near. The wagon contained a load of firewood, no iron rails or metal. He was wearing a felt hat with a metal buckle in front, a khaki

[1] District Surgeon, Pietermaritzburg, Natal.

tunic with black metal buttons, a belt with a metal buckle, black
cloth trousers, no boots ; nothing in his purse ; nothing in his pockets.
Suddenly the first flash of the storm came ; there was no rain. He
did not see the flash nor hear the thunder. The upper part of his
trousers was burnt, and they dropped down, but his legs escaped injury.
The two mules he was leading were killed, and three others behind

Case of arborescent burning by lightning.

them.   The driver on the box-seat escaped, and took the patient on to
Vryheid Hospital, where he remained three months. He recovered
with a few superficial scars on the left arm, and the condition shown
very well in the photograph.

Dr. IRONSIDE BRUCE showed a series of skiagrams of chest condition
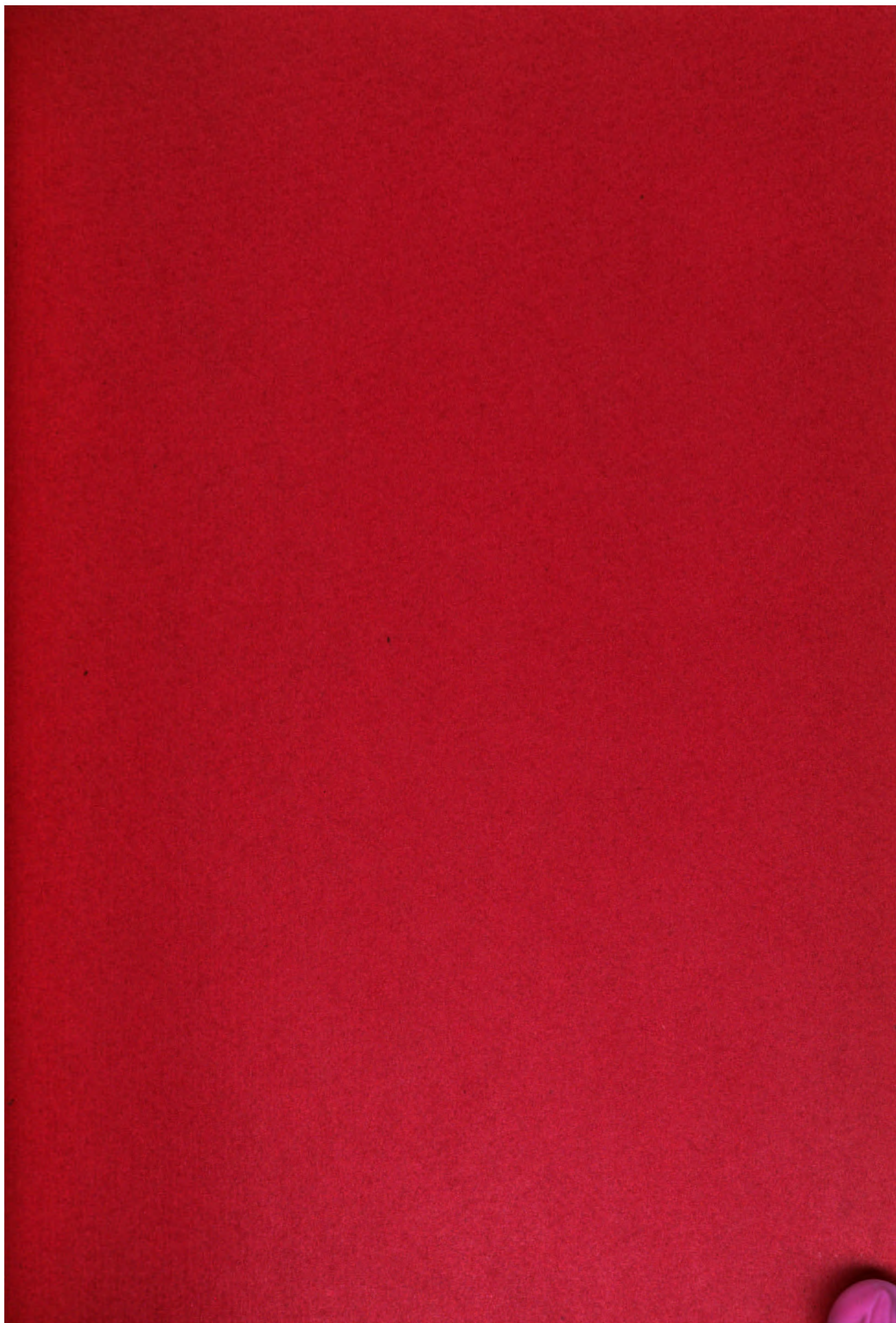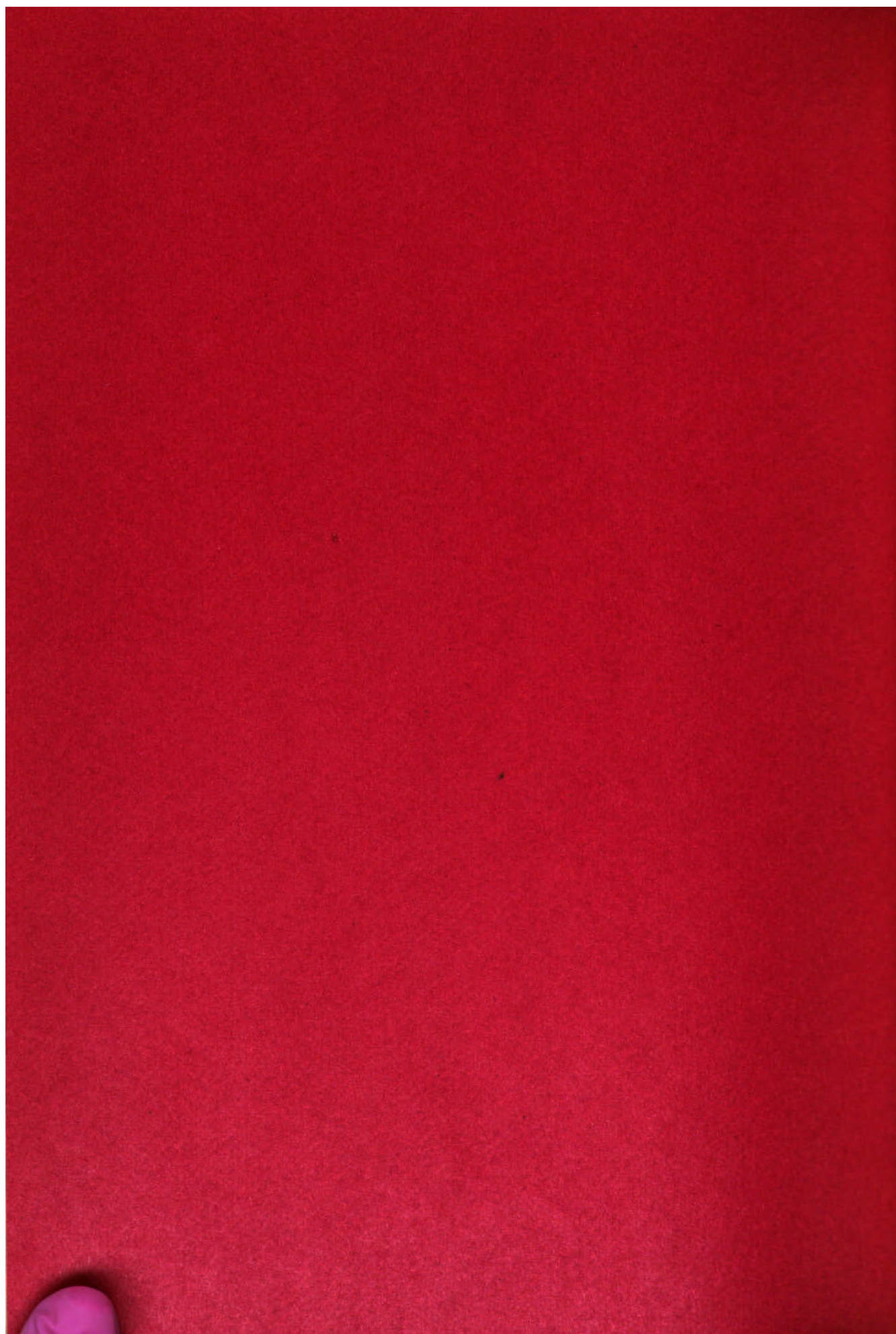
Epidemiological Section.

October 25, 1912.

Dr. W. H. Hamer, President of the Section, in the Chair.

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PRESIDENTIAL ADDRESS.

The Influence of Migration upon the Phthisis Death-rate.

THE wide influence which has been exercised by the epidemiological investigations of Dr. Bulstrode, and the devoted services rendered by him, during more than twenty years, as an officer of the Epidemiological Society, marked him out as the member of the Section who would follow Dr. Theodore Thomson as the occupant of this chair. Dr. Bulstrode's deeply lamented death has made such succession impossible, and Dr. Theodore Thomson and the Section have called upon me to act in his place. I have felt bound to acquiesce, for I realize that during the years in which I was privileged to assist Dr. Bulstrode, in his endeavours to promote the Society's interests, I enjoyed special opportunities of learning the working of his mind, in so far as his beloved epidemiology was concerned. The subject for present consideration must then necessarily be his subject, that of his Milroy Lectures, and of his Sanatorium Report.

No epidemiological phenomenon of the last fifty years is more striking—none is perhaps so little understood—as the decline in the death-rate from phthisis. Many times has it been discussed before the Epidemiological Society, and you are all familiar with the papers which have been read. Professor Pearson, at York, the other day, alluding to a certain class of literature (" If," he said, " I may venture to call it such "), stated that " medical officers of health certainly read their own reports," but he doubted " how far they had leisure to study those of their colleagues." Medical officers of health, on learning that they may venture to regard their reports as literature, will doubtless experience some such gratification as was felt by M. Jourdain, when he was made

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to realize by the Maître de Philosophie, that for forty years and more
he had been talking prose without knowing it.   Turning, however,
to Professor Pearson's main contention, if it be based upon "iatro-
mathematical" methods it may be deemed presumptuous to criticize it:
but its "probable error" must be very large.   At any rate, our withers
are unwrung, for we have all been deeply interested in this problem of
phthisis, as discussed by epidemiologists from the time of Buchanan,
in the sixties, down to the work of Longstaff, Payne, Bulstrode,
Newsholme, Niven, Ransome, Squire, Beevor, Bulloch and Greenwood,
and Shirley Murphy in recent times.   We have even tried to decipher
the meaning lying hidden behind the hieroglyphics constituting the
chief means of expression in the literature (if we may venture to call it
such) of the biometricians.

And here it should be noted at the outset, that if the inscription
which confronts us be not "All hope abandon ye who enter in," it must
be almost as little encouraging.   Farr, Ogle, Tatham, have all warned
us.   Bulstrode wrote: "All these statistics must be accepted with the
greatest circumspection and reserve"; and, he added, "the difficulties
are due mainly to altered nomenclature, better diagnostic methods,
greater facilities for obtaining medical assistance in hitherto inaccessible
districts, and the application of bacteriology to medicine."   But then
he says, quoting Dr. Straus, "La statisque malgré ses imperfections
demeure encore le meilleur élément d'enquête."   Bulstrode none the
less felt that the difficulties from this side were far greater than was
generally believed, and the question more than once arose in his mind,
"Has phthisis really declined at all?"

In attacking the problem from the alteration of nomenclature point
of view, it needs to be recognized that no single disease heading will fill
the gaps left at the various age-periods.   Ogle tried his hand at inter-
change between phthisis and diseases of the respiratory system.
Newsholme has shown that transference to pneumonia and bronchitis
is not in itself sufficient to explain decline in phthisis.   The last word
has probably not been said on the nomenclature question, but, however
it be examined, after accounting for this perturbation and that, due to
this and that possible transference, there has always remained a sense
of some influence as yet undetected.   That varying nomenclature itself
has played havoc with the figures cannot be questioned, having regard
to the differing connotations of the "decline" of the fifties and the
"pulmonary tuberculosis" of the present day.   Fothergill held that the
mortality from consumption was "estimated too high, in the parochial

returns, all those who die of any lingering disease being generally registered as consumptive"; and Thomas Young said, "the name 'consumption' was never intended by the ancients to denote a wasting of the lungs themselves, which it was impossible for them to ascertain, but a wasting of the body, depending on a disease of the lungs." There must, further, be remembered the great extension of the use of the term "cancer," and the wide employment, nowadays, in the case of diseases accompanied by wasting or decline, of special designations—diabetes, anæmia, leucocythæmia, lymphadenoma—and the increased assignment of deaths to various forms of heart disease, and to diseases of the nervous, urinary, and gastro-intestinal systems, and the rest. A further point which suggests that fashion and other special circumstances in particular countries still play a part, is the differing age-incidence of phthisis deaths in, for example, Germany, England, and Ireland.

The astronomer having made his calculations, decides that there must be some dark body which perturbs the star whose motion he is investigating; so is it with phthisis death-rates, some unrecognized influence is manifestly at work. The generally accepted explanations—better feeding, improved housing, and the rest—assuredly do not account for all the facts. After making appropriate allowance for them all, and after taking into account the nomenclature difficulties, there is still an unexplained decline. To what is it due? I venture again to draw your attention to an aspect of the question touched upon by various writers, but which is deserving of much more careful study than has hitherto been devoted to it. I refer to the question of migration.

We, of course, have all, at one time or another, glanced at this question, but the problem is a difficult one. If once it be accepted as meriting serious attention, it becomes surprising to note how cursorily it has been dealt with, even by classical writers on the "Declension of Phthisis." Sir Hugh Beevor, it is true, starts by stating that its influence is not unimportant. He asks, "Do people return home or seek the country to die?" Taking first West Ham, he finds, contrary apparently to expectation, that patients from this district die in London hospitals. Taking, again, Freebridge, Lynn, and Hingham in Norfolk, he has to record 10 per cent. of imported cases. This, from our point of view, is a percentage worthy of consideration; but he infers that "rural incidence cannot be said to be masked by immigration." Then he turns to age-incidence, and argues that both at 10 to 20, when emigrants from the towns are few, and at 20 to 35, when they are more numerous, the big towns have lower rates

than the rural districts; hence, he concludes, "the Registrar-General's returns truly tell the county phthisis-rates." I hope to be able, in the sequel, to adduce considerations which will show that there is more than this in the age-incidence question. Dr. Newsholme, in the *Assurance Magazine*, vol. xxxiv, criticized Sir Hugh Beevor, and in particular his comparison of urban and rural rates. The criticisms are interesting, but are necessarily only *obiter dicta*. In "The Prevention of Tuberculosis," however, the importance of the migration difficulty is clearly recognized. Dr. Newsholme says (p. 206): "Any set of figures, intended to measure disease-incidence, must, in particular, be free from the fallacies due to migration of patients, whereby an infection may be acquired in one district and be chronicled as disease and death in the statistics of another. For this reason, among others, local statistics have to be handled with caution, even when they concern acute infectious diseases of only a few weeks' duration. Tuberculosis is not only an infectious, but also a chronic, disease, which, on the average, probably extends over years, and often escapes recognition during a large part of the time. Fallacy is almost inevitable in such a case, if inferences as to causation are sought from individual groups of local statistics." . . . "The figures of a small rural county, with a population less than that of many single towns, could only be used for inference as to the causes of variations in its tuberculosis death-rates, if correction were made for the migration of healthy persons to towns, and of sick persons to their country homes, where they can live at a smaller cost and nearer their own people." Dr. Newsholme, therefore, seeks to avoid the migration difficulty by rejecting all "parochial" statistics; thus, he says, "To eliminate or minimize the effects of migration and complexity, we must study communities in which the balance between immigrant and emigrant is small relatively to the total volume of disease, and which are so large as to allow the operation of complex phenomena to become evident." Upon this the criticism may be made that accurate knowledge, collected in a limited field, may have more value than inferences based upon a large mass of imperfect records, and Dr. Newsholme, presumably, has this possibility in mind, for he adds, in qualification of the statement already quoted, "The experience of smaller communities can only be taken either as hints, which may possibly be confirmed by other information, or as illustrations of the manner of action of influences, of which the existence has been demonstrated independently." Hints and illustrations sometimes carry us far. Thus it

may transpire that imperfections, discoverable on study of familiar parochial figures, may run all through national statistics; and in that case it is important to note that it does not necessarily follow that all difficulties will be overcome by widening the scope of inquiry. It is true we are constantly being urged, as recently by Professor Pearson at York, "to give value to weight of numbers"; or, again, to apply our formulæ, if necessary, even to loose data, with confidence that "modern mathematical methods reach a perfectly definite result when applied to such data." But we need also to remember that a little leaven leaveneth the whole lump, and it may be found that the experience of a rural county will furnish "hints confirmed by other information," and "illustrations of the manner of action of influences," which affect the death-rates of kingdoms and continents. Dr. Newsholme, in his book has, further, a striking chapter (xxix) in which he discusses Virulence, Natural Selection and Decadence, and in which, more or less incidentally and in connexion with Ireland, migration again comes under consideration; but to this chapter it will be necessary to return later.

When two accomplished epidemiologists have surveyed the ground and have set up the warning "No road here," it seems temerity to attempt to advance. But there is authority in a contrary sense also. Indeed, no less a person than Thomas Young was apparently convinced that it was imperatively necessary to deal with the influence of migration.[1] Furthermore, there is the consideration that Nature, as Hecker has reminded us, "permits not any phenomenon to originate from isolated causes"; the effect is the resultant of a multiplicity of causes, each of which must be reckoned with. The rise and fall of the phthisis death-rate are determined by many influences, and it is necessary to study every possible influence, and some require much looking for. The observer watching a "tug of war" between two competing teams might greatly err if he correlated the tractional force exerted by any single member of either team with movement to one side or the other. For some seconds the rope may remain stationary, and yet an individual member of a team may, for part of this time, pull hard, while for the remaining part he may have been practically *hors de combat*. Another member may silently exercise throughout steady traction, which materially influences the result, and yet his efforts may fail altogether to excite notice. So in this matter of decline of phthisis,

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[1] *See* "Consumptive Diseases," 1815, pp. 95-97.

it is quite easy to overlook an important determining influence, and perhaps partly on this account to attach undue importance to some obtrusive factor which shows for a time close correlation with phthisis movement. It is becoming generally realized that it is necessary to look very critically into questions of correlation; there are, indeed, nowadays, those who argue that the more complete the correlation the less likely is it to imply causation, and the more likely to connote coincidental effects of some common cause. The trained statistician is, on his part, beginning to urge application of the method of " treatment by partial correlation "; but with regard to this it is perhaps pardonable to adopt the opinion pronounced concerning the terrible language of the Basques: " There are those who say that the Basques understand one another, but for my part I refuse to believe it."

Something can, however, be accomplished by " long-continued labour in the minute sifting of numerical results," even by the aid of ordinary arithmetic, and I desire, in the first place, to fix your attention upon a familiar example of such careful sifting worked out by Sir George Buchanan fifty years ago. Here, indeed, is material of the utmost importance in relation to migration, and, if I am to carry you with me at all, I must first interest you once again in this masterly and fascinating inquiry.

In the " Report upon Phthisis in Kent, Surrey and Sussex "[1] we have, in fact, forced on our attention need for consideration of a powerful influence, working unobtrusively and yet declaring itself in unmistakable fashion when once we look for it. It will be remembered that Sir George Buchanan arranged the fifty-eight registration districts of Kent, Surrey and Sussex according to the order of their death-rates from consumption. In determining this order persons between the ages of 15 and 55 were alone considered, the mean of the death-rates of the two sexes being that which primarily determined the position of the districts in the table; but where the male rate was obviously subjected to disturbing influence, from which the female rate was comparatively free, the position of a district was determined by the latter rate. Furthermore, certain difficulties which surrounded this statistical inquiry were " laboriously attacked," but not in every instance " satisfactorily overcome." Again, it seems to be generally agreed that the main conclusion arrived at, that " wetness of soil is a cause of phthisis to the population living upon it," merits further

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[1] Tenth Report of the Medical Officer of the Privy Council (1867), 1868, pp. 57-110.

study and examination, in the light of knowledge now available after the lapse of nearly half a century. I desire to direct your special attention, then, to three points. First, to the ages considered in

Phthisis death rates (males, females, and all persons) for the decennial period 1851 – 60, compared with the corrected mean phthisis death rate for the same period.
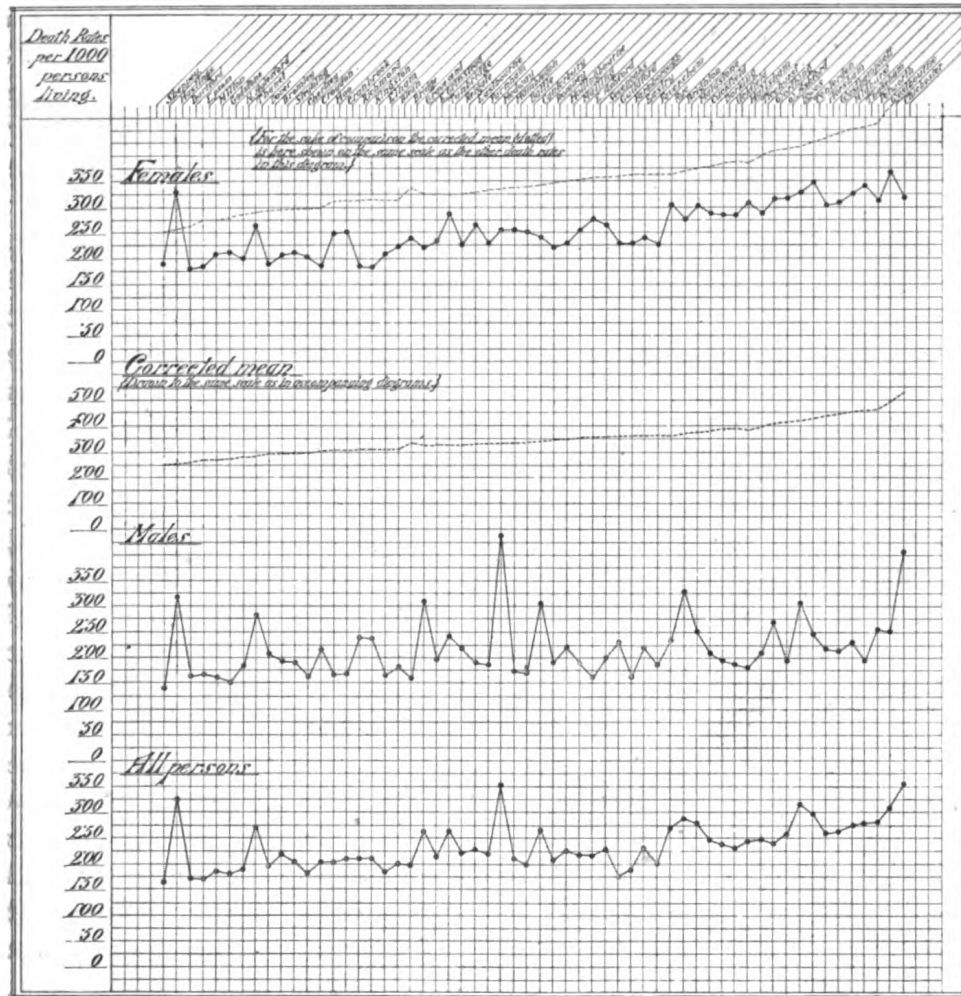
DIAGRAM I.

arranging the districts in the order of their death-rates; secondly, to some of the difficulties "laboriously attacked"; and, thirdly, to the statistics of the fifty-eight districts in the later decades.

Taking first the age question, I hope to be able to convince you that demonstration of wide variations in the death-rates of the registration areas was in part facilitated by the fact that attention was confined to the ages 15 to 55, and that special stress was laid, in cases of difficulty, upon the female death-rate.   In almost all the hardly hit districts the female death-rate was disproportionately high, and the age-distribution of the population, and particularly of the female population, was quite abnormal.   Sir George Buchanan observes, in speaking of Hailsham, "There is no known reason why the female rate should be in such very great excess of the male, but the same fact will be observed in most of the districts which have high rates."

If the rates for persons, males, and females, at all ages, in the fifty-eight districts, and the corrected mean rates at 15 to 55 (both sexes) for those districts, be plotted out in juxtaposition to one another and examined (diagram I), it will be seen that the curves showing the rates for persons and for males present marked irregularity; that showing the rates for females has a more marked tendency to rise on proceeding from the lowest to the highest districts of the series; the corrected mean rates (both sexes) for the ages 15 to 55 show, however, in comparison with the female rate at all ages, a more steady increase and a considerably wider range on proceeding from the most to the least favoured districts. This last-mentioned point will be made clear if the slope of the broken line in the middle of the diagram be compared with that of the broken line at the top of the diagram.   The former line (which is drawn to half scale) has a slope comparable to that of the female death-rates; the latter (drawn to full scale) has a steeper slope.   In relying upon the rates at the special phthisis ages Sir George Buchanan was, of course, in design, correcting for age-distribution of the populations concerned, but, by making this correction, he, as a matter of fact, actually brought into greater prominence the differences in the series of districts examined, and thus made more uniform, and at the same time steepened, the slope of the curve relating to those districts.   The reason for this becomes clear when it is realized that in many of the hardly hit districts there was notable deficiency in the number of persons at the phthisis ages, and that the deficiency is particularly exhibited in the case of females, and especially of women aged from 15 to 25.   The fifty-eight districts include, in point of fact, a number of rural districts (diagram II) showing deficiency of females aged 15 to 25 ; they also comprise certain towns—Hastings, Lewes, Brighton, Steyning (including Worthing and Hove), and Chichester, which show a marked excess of females at these ages (diagram III).

Clearly we have, here, to deal with the influence exerted by migration from rural districts to the towns. Sir Hubert Llewellyn Smith, in his chapter on "Influx of Population," in vol. iii of Mr. Charles Booth's

Age distribution of the female population of six Sussex registration districts compared with that of England and Wales.
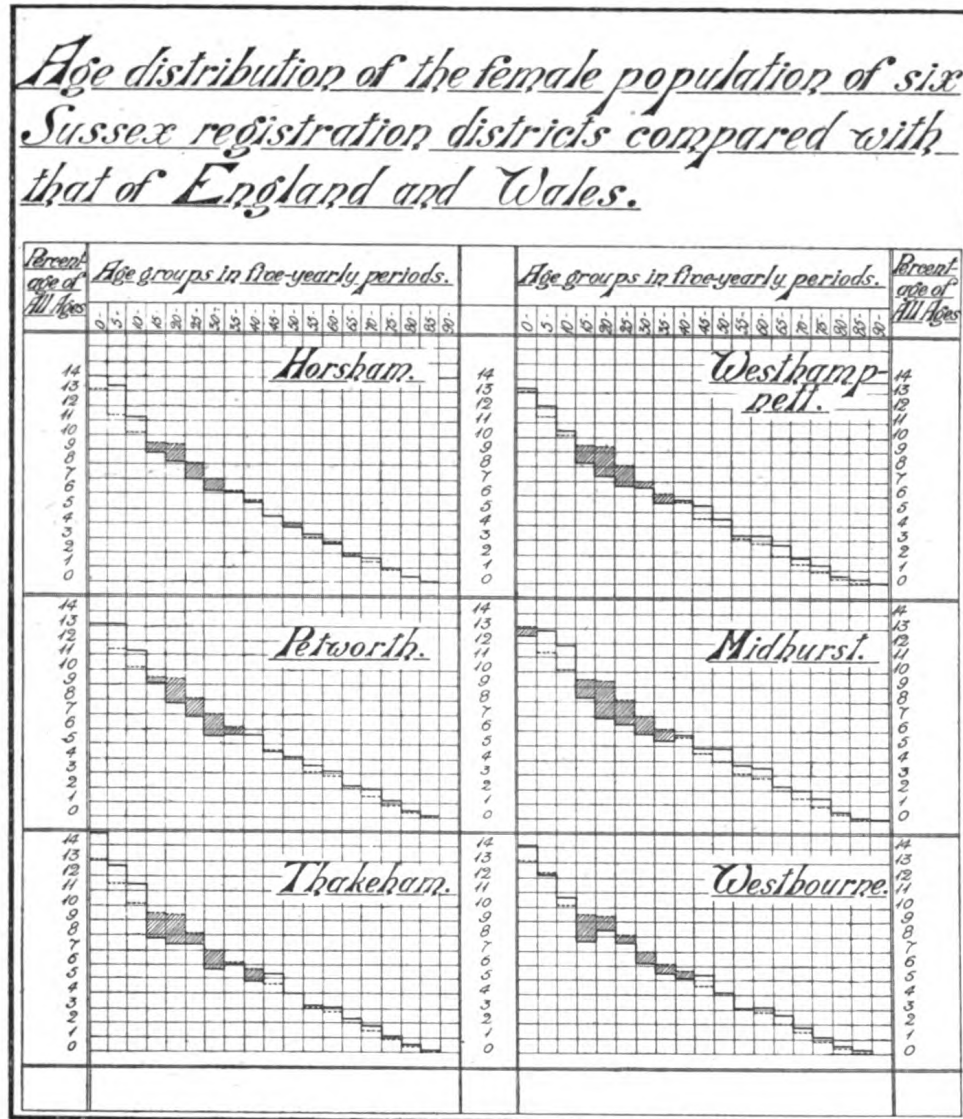
DIAGRAM II.

"Labour and Life of the People," carefully discussed this subject, and his authority can, therefore, be appealed to as regards the actual facts. He describes a village, in the centre of a purely agricultural district in the Eastern Counties, in the eighties. The picture to be drawn of

Sir George Buchanan's Sussex villages might almost be a replica of this, though the difference in date (the eighties as compared with the sixties) should not be lost sight of.   Sir Hubert wrote, speaking generally of

Diagram shewing the variation at successive age periods in 1861 of the female population of Sussex compared with that of a group of five selected towns (Hastings, Lewes, Brighton, Steyning and Chichester) and of the remainder of the County when this group has been deducted.

Female Population.	*Age periods.*							
	0 — 5	5 —	10 —	15 —	20 —	25 —	30 —	35 —
24000								
23000								
22000								
21000								
20000								
19000								
18000								
17000								
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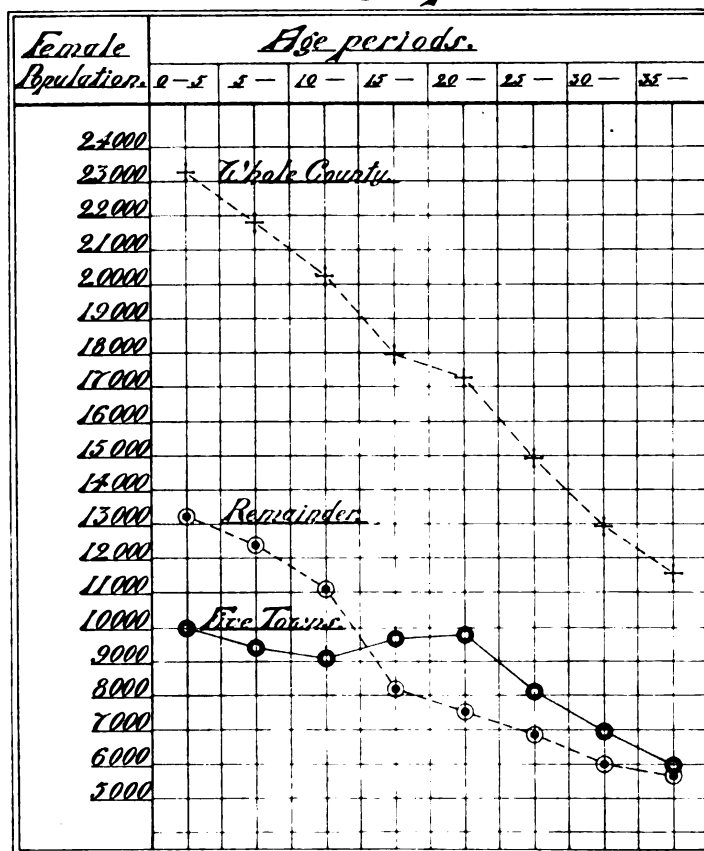
DIAGRAM III.

the area he was dealing with : " The proportion of young men from 20 to 25 in the district is a third too few, and of men over 60 twice too great, as compared with the whole country." . . . " In the school all the brightest boys are living in the expectation of going up to town.

Most of them have relations there already. At home, there is no opening, and it is deadly dull. Hard by dwells a labourer with a family of twelve. Six are in London already, and the rest will follow when old enough. Across the road there used to live a family of nine. All the sons and daughters are now gone; six to London, one to a neighbouring village. It is the same in all the villages round." Then follows an account of the career of a migrant ("one Potton, from Little Guilden ") in which occur the statements, "a country nucleus, once established in any particular district in London, grows in geometric ratio by the importation of friends or relatives"; again, "the loss of rural industries has thrown the labourer on the land for support and closed the door to women's employment"; . . . . once again, "more potent, perhaps, than any of these causes, has been the change wrought by the school, the railway, and the penny post."

Then on the question of age, he says, 80 per cent. of the migrants are between 15 and 25 years old; and, further, as regards sex, he speaks of "the great difficulty of obtaining satisfactory statistics on the question of female migration. We know that, as a whole, it is greater in volume than that of men—that is to say, on any given day more women than men are living outside the district of their birth. Of course this is largely due to the demand for domestic servants, who, as noted above, become in turn centres for promoting fresh migration. But there is also a large non-economic element, arising out of the fact that a woman, on marrying, is more likely to live in the district where her husband previously resided than vice versa. This fact is enough to make the interpretation of the statistics of female migration very difficult." The final sentence must be quoted: "Perhaps we may say that there is a set of productive labour towards centres of high wage and high cost of living, and of unproductive consumers towards districts of low wage and low price."

All these conclusions drawn from study of the Eastern Counties and of East London may be held to be paralleled in the facts presented by the villages of West Sussex, twenty years earlier.[1] The question has been illustrated at length because it is clear that if persons at the

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[1] The contrast between a growing industrial community like that of Lancashire and the Sussex population can be seen at a glance on consideration of the following figures :—

Lancashire	Increase in population, 1851-61	...	...	398,065
	Excess of births over deaths	...	...	254,178
Sussex ...	Increase in population, 1851-61	...	...	27,232
	Excess of births over deaths	...	...	40,853

phthisis ages are being removed from the villages, the phthisis-rates at those ages must be materially affected. Careful examination of the districts studied by Sir George Buchanan shows that those with the highest rates are, as he stated, districts in which the female rate is in great excess of the male; and further, in them there was consistently manifested a deficiency of females, and less conspicuously of males, at the phthisis ages. We have to consider, therefore, whether migration of persons at these ages from the hardly hit districts was specially favoured during the decade to which Sir George Buchanan's figures relate. In these districts the population at the phthisis ages is conspicuously below normal, and the death-rates at those ages are conspicuously higher than normal. Are we not justified in assuming that young adults were, at the time of the inquiry, leaving the villages, but returning to them in some instances when ill and unable to work? Confirmation of such an assumption is afforded by the consideration that the death-rates at the phthisis ages, in these hardly hit districts, are much higher in women than in men; for it is well known that women more especially tend to return to their homes when they are ill.

If such a combination of circumstances as that above outlined actually operated in certain villages, it will be apparent that Sir George Buchanan, in making correction for age-distribution, was really throwing into bolder relief than ever the disturbing influences operating upon the various age-groups. If, in point of fact, the girls and young women of the Sussex villages mainly represented among the hardly hit districts were, during the sixties, migrating in unusual numbers into London, Brighton, and other towns, and if some of them, on becoming phthisical, returned to the Sussex villages, and died there, there would be sufficient explanation of the abnormal age-incidence and the abnormal female phthisis death-rates. Furthermore, in calculating death-rates upon the ages 15 to 55, an excessive number of deaths would be applied to a population erring on the side of defect, and it would, therefore, come about that, in making correction for age-distribution, Sir George Buchanan was really steepening his curve, and tending more than ever to thrust the districts, in which migration was especially marked, towards that end of his series in which the higher rates were observed.

This, then, is the point to which we are brought by examination of the question of the ages dealt with. It will be well, now, to turn in the second place to some of the difficulties "laboriously attacked, but not in every instance satisfactorily overcome." Among these were

included the influence of institutions in increasing recorded mortality from consumption, and the use of certain places as resorts for consumptive invalids. Very striking are the comments, for example, on *Gravesend*, which "is not a little used by the poor of the East End of London, who, when they get consumptive, find this town cheap, and to their notions like the seaside." Again, at *Eastbourne*, "deduction must be made for visitor invalids." At *Farnborough* reference is made to the "special occupation of 3,029 of the male population, any of whom, when they are ill, are sent out of the district to hospital." At Walmer, in *Eastry*, the possible disturbing influence of the marine hospital and barracks is noted. In *Sheerness*, "The census papers give evidence of considerable importation of males, from 15 to 45 years old, and of some exportation of them, after the latter age; a large proportion of the incomers being unmarried. The presumption is that these people are of the healthier, and that if they were unable to work they would go away from the district to be nursed. Local information confirms the conclusion that the phthisis-rate of males is thus artificially lowered." Speaking again of *Sheppey*, Sir George Buchanan says, "It is pretty clear that many females also spend the middle period of their lives here, probably coming and going with their husbands, or in case of illness returning to their previous residence. . . . they are treated when sick in the hospital attached to these barracks; but, if they get phthisis, are often discharged invalided, and die in other districts." In *Hastings*, "Certainly more than half the registered mortality from this disease (phthisis) is among visitors." In *Thanet* the phthisis-rates are raised "to a great and unascertainable extent by the practice of sending consumptive invalids to Margate in the late stages of their complaint." In *Tonbridge* "not less than half the consumptive deaths of that town (Tunbridge Wells) have been among visitor invalids." In *Medway*, "the male death-rate is greatly affected by the presence of a number of military and naval establishments in the district."

Perhaps the most significant comment is that made in respect of *Brighton*. An "important disturbing influence (whose amount cannot at all be ascertained) is the use of Brighton as a place of residence for consumptive invalids; or the converse disuse of the town by residents who there become consumptive." This last suggestion is a particularly illuminating one. We have seen how the Sussex villages near Brighton are depleted of their young women, and how Brighton itself shows a notable excess of females at from 15 to 35 or 40 years of age. The

tendency noted on the part of the female residents of Brighton at the phthisis ages to disuse the town *when they became consumptive* is very important, as there can be no doubt that many of these women came from the neighbouring Sussex villages, and that it was to these villages they ultimately returned.

There is, here, then, evidence of drift of a very striking character. Dr. Newsholme, in his book (p. 207), has commented on the fallacy of drawing inferences as to the effect on phthisis of "overcrowding," without carefully weighing the extent to which the inhabitants of the overcrowded tenements "drifted into them after, and, perhaps, because they had become consumptive." Again, he says, allowance should be made in comparing different districts "for the influx of consumptives into poorer districts as they go down in the social scale." Similar evidence may be extracted from Cornet's figures relating to inmates of Catholic nursing institutions in Prussia. The death-rates there recorded were, at any rate, in considerable degree, augmented by reason of the fact that those trained in the institutions, and afterwards going out into the world, gravitated back to the institutions when they became phthisical; while apparently more potent still was the attractive influence exerted upon women already the subjects of phthisis, an influence clearly demonstrated by the very large percentage of recorded deaths occurring among those who had quite recently entered the institutions. In the same connexion the parallel instance of the common lodging-house may be referred to. Sir Shirley Murphy has pointed out that the histories of the phthisical inmates of common lodging-houses in London show that symptoms of phthisis were already present in nearly half the cases investigated, prior to the persons in question having ever entered a common lodging-house.

A third point now remains to be referred to, the question of soil dampness and its relation to phthisis mortality in the fifty-eight districts in successive decades. Sir George Buchanan's main thesis is illustrated by him so fully as to leave practically nothing to be said. Too great stress must not, however, be laid upon soil dampness, for, as he pointed out, the district "which has by far the lowest registered phthisis death-rate of any in the south-eastern counties is an island of London clay"; while, again, the districts most hardly hit were almost without exception grouped in the south-western portion of Sussex, where the chalk is well represented. A new source of difficulty, however, with regard to the dampness of soil hypothesis is encountered by reason of the fact that the order observed in the sixties has not been followed in

succeeding decades; some such similar arrangement is, indeed, traceable in the seventies, and dimly discernible in the eighties, but it is practically non-existent in the nineties, and in recent years has been entirely lost (*see* diagram IV).

Phthisis death rates for all persons in 58 sanitary areas in Kent, Sussex, and Surrey, for the decennial periods from 1851 to 1900 compared with the corrected mean phthisis death rate for 1851-1860.
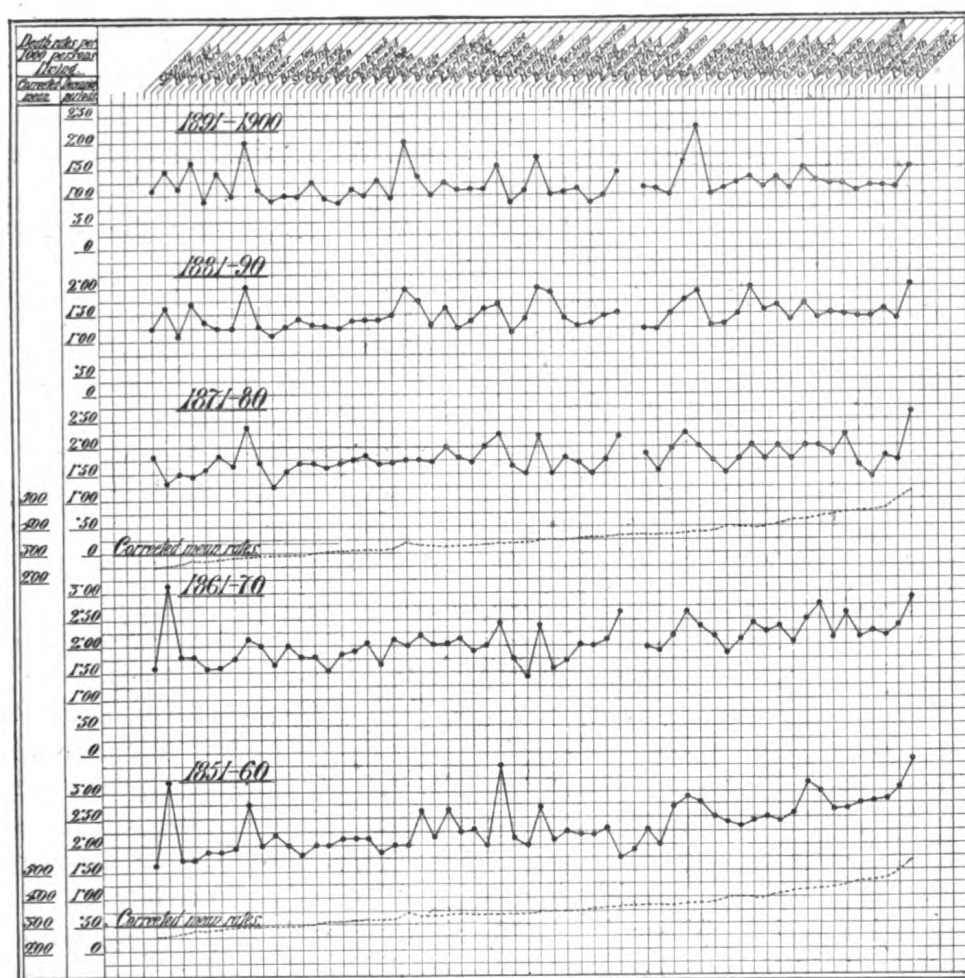
DIAGRAM IV.

Dr. Charles Kelly, Medical Officer of Health of West Sussex, in commenting (1879) upon the improved death-rates from phthisis in six Sussex rural districts, said : " In these rural districts there has been no change whatever in the drainage, and so far as the removal of subsoil water is concerned, the houses are in much the same state as they were twenty years ago ; the great difference in the amount of consumption is probably dependent upon many causes—the improved state of the cottages, the rise of wages, leading to the children being better clothed and fed, the increase in railway communication which tends to diminish intermarriage and to cause more change of population—all these changes, social as well as sanitary, have had their share in the improvement." Dr. Kelly noted, moreover, " that most of the impervious beds are to the north of the South Downs, and consumption seems most common in places which are bleak and exposed as well as damp." Again, he says, " In Dr. Buchanan's report, amongst the West Sussex districts, Steyning was the highest and Petworth the lowest on the list ; had the comparison been made in the next decade, 1861-70, the position of nearly all the unions would have been materially altered." He continues, " The consumption or phthisis death-rate has been distinctly lowered in recent years, but the above facts do not seem to show that dampness of soil has a very intimate connexion with the disease, because such great variations occur in the prevalence of the disorder, while very little, if any, change has taken place during the same period in the drainage of the soil." Dr. Kelly, in a later report (1887), returned to the subject, and concluded that " the mortality from phthisis and all causes is very nearly the same on each variety of soil " ; and, again, that " the order of the districts as regards mortality is quite altered."

An interesting paper on " The Effects of Intramigration on National Health " has recently been published [1] by Dr. J. Stewart Mackintosh, in which it is pointed out that before the days of cheap and rapid travel the rural population " consisted largely of small and practically isolated communities, closely inbred and closely specialized for local climatic and social conditions." Dr. Mackintosh holds that when members of these communities migrate there is great danger of degeneration," if the new environment differs materially from the old." He draws his illustrations from the effect of removing two distinctive Sussex types of domestic servant to North-west London. The one comes from the Weald, the

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[1] *Brit. Med. Journ.*, 1912, ii, pp. 367 71.

other from " the coastal strip which comprises the well-known chalky
South Downs." Dr. Mackintosh urges that " Until the county of Sussex "
was " opened up by improved roads, and the advent of the railway
encouraged the development of the great coast towns, the population
had been undisturbed through long centuries." Experience shows, he
says, that North-west London suits the Weald type, but does not suit
the coastal type; in the one case there is migration from the Weald
clay to the London clay; the individual of the other type " coming
from a highly permeable soil, finds herself in an environment differing
materially from that in which her stock has undergone evolution during
a number of centuries, particularly in respect of humidity of soil and
confinement to the house." Dr. Mackintosh does not refer to Sir
George Buchanan's report, but it would be interesting to know more
of the distribution of his two types in relation to the fifty-eight
Sussex registration districts.

In view of the three sets of circumstances which have now been
considered—viz., first, the remarkable relation in which the observed
order of the fifty-eight districts in the sixties stands to peculiarities of
age-distribution; second, the notable influence of migration during that
decade; and third, the failure on the part of the fifty-eight districts to
exhibit the same order as regards phthisis mortality in the later decades,
it is necessary to make further study of the special circumstances of
the original decade.

In diagram V the ratio per cent. of persons 20 years and upwards,
engaged in agriculture (1851), has been plotted out for the fifty-eight
districts, and the curve is shown (at the lowest part of the diagram) in
relation to the dotted line indicating phthisis prevalence. The urban
areas, Thanet, Richmond, Croydon, Gravesend, Medway, Canterbury,
Brighton, and Chichester, show, as might be expected, wide range of
variation, but, generally speaking, the rural districts with a high per-
centage of persons over 20 years of age engaged in agriculture are
districts with high mortality from phthisis.

The next curve on the diagram shows increase or decrease in agri-
cultural labourers in 1861 (as compared with 1851); decrease being
shown by excursions upwards, and increase by excursions downwards.
Richmond, Gravesend, Medway and Canterbury, as before, are quite
exceptional (the figures being small and untrustworthy in these
instances). The curve as a whole shows some correspondence with
the rise of the dotted line, though this is less marked than in the
lowest curve.

N—9

On coming to the question of diminution in the numbers of young females aged 10 to 25, the general trend of the curve is quite similar to that of the dotted line.   Steyning (which contains Hove and Worthing), Kingston, Reigate and Eastbourne, Farnborough, and of course Brighton, show wide variations, but on the whole there is most un-mistakable correspondence between the extent to which the fifty-eight districts suffer from phthisis, and that to which, in 1861 as compared with 1851, they displayed a diminution of females aged 10 to 25 years of age.   The uppermost curve shows the female phthisis deaths (ages 15 to 20) per 1,000 of population, in comparison again with the dotted line, and the correspondence here, of course, is fairly close.

Having in view, then, the extent to which agricultural depression is known to have operated in the sixties ; the great attraction exerted upon the young adult population of the agricultural villages by London and the rapidly growing provincial towns, during that decade ; and the close correspondence exhibited by the curves showing phthisis prevalence with the curve indicating migration from the fifty-eight districts, and in less degree with those measuring agricultural depression, there can be no doubt that the order of phthisis prevalence in the fifty-eight districts was largely determined by movement of population.

This consideration, taken in conjunction with the striking instances of the influence of migration cited in connexion with particular districts by Sir George Buchanan, raises, however, a larger question.   We realize that in the case of a disease like phthisis, movement of popu-lation has a vastly larger effect upon death-rates than is manifested with diseases of comparatively short incubation period, and we have now to inquire whether conditions which so profoundly affected the statistics of a few Sussex villages in the sixties may not have exercised an influence, the extent of which may not yet have been sufficiently realized, upon phthisis statistics in the world at large.

An objection may be urged, however, to the effect that migration has been continuously in operation, while the excessive incidence of phthisis upon the hardly hit districts was especially marked in the sixties.   The reply to this is that in these inquiries we are always dealing with an interplay of forces, at one time one factor assumes prominence, at another time another.   The relation of dry years to scarlet fever prevalence was detected by Dr. Longstaff, as the result of study of scarlet fever mortality, year by year, in the sixties and seventies, but no one doubts that dry seasons exert, year in and year out, their influence on scarlet fever.   The circumstances of the sixties and

seventies specially favoured Dr. Longstaff. In a similar way, the great
development of means of intercommunication in the sixties, together
with the agricultural depression and the suctional action exerted by

*Corrected mean phthisis death rates, 1851–60, in 58 sanitary areas in
Kent, Sussex, and Surrey, compared with variations in agri-
cultural employment and in age distribution of females in those
areas.*
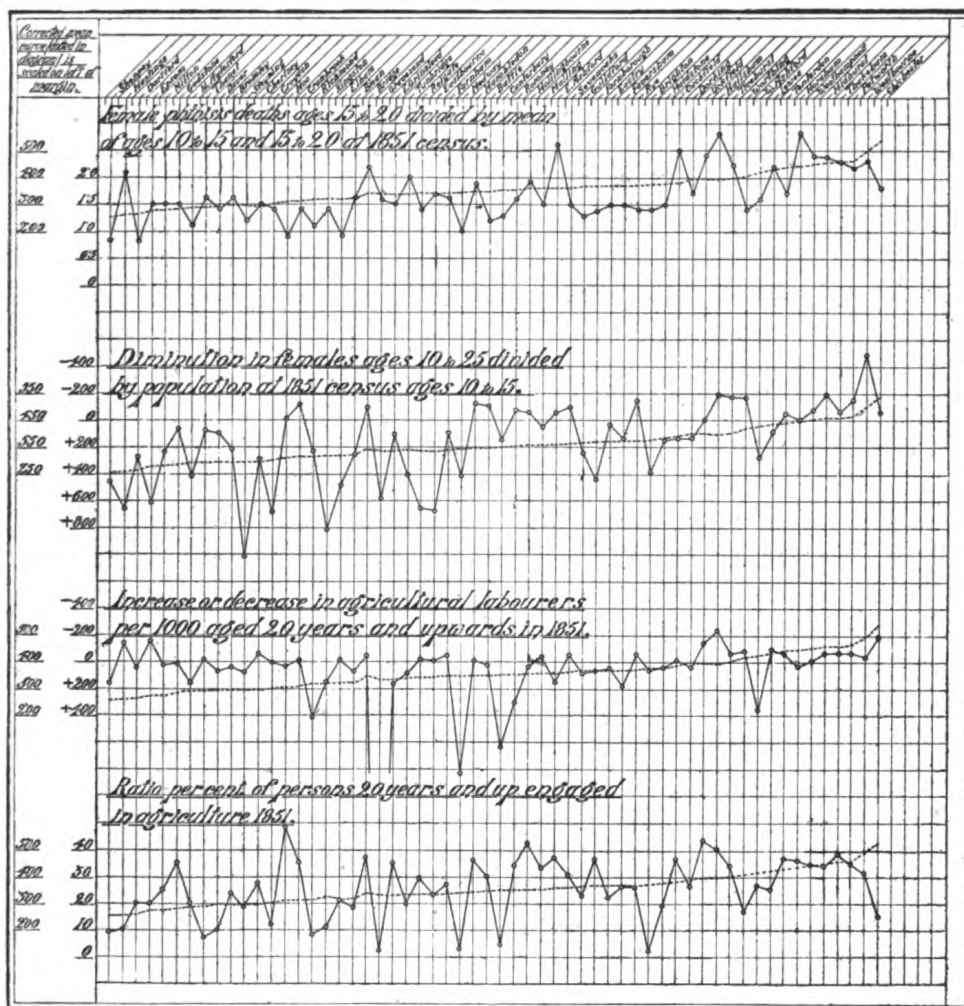
DIAGRAM V.

the rapidly growing towns, favour the collection of evidence as to the
effect of migration upon death-rates from phthisis in that decade.
The geologist who sees in some valley among the mountains certain

rounded hillocks, recognizes that he has evidence of the former existence of a glacier; but he knows quite well that these hillocks cannot be plainly discerned in every valley into which a glacier has descended. Careful consideration emphasizes, in a similar way, the conclusion that the statistics of Thakeham, Westhampnett, and the other villages, present clear evidence of the influence of migration upon phthisis mortality fifty years ago, and that, notwithstanding the fact that similar evidence is not obtrusively apparent on study of the figures of later decades.

If, therefore, I have carried you with me thus far I will ask you to follow up the clue and see if it affords help in dealing with a larger problem. Sir Shirley Murphy pointed out at York that " the death-rate from all causes, in England, fell from 22 in 1875 to 16 in 1901-05, or six in the thousand of population; the phthisis death-rate fell in this period from 2·2 to 1·2, or one in the thousand of population; hence the decline in phthisis is responsible for one-sixth of the decline from all causes." He added, " I think we may say that nearly two-sixths of the decline in the total death-rate has been due to decreased mortality in epidemic diseases, the trend of which is governed, in the main, by the natural behaviour of these diseases; that one-sixth of the decline in the total death-rate has been due to decreased mortality from phthisis, which in various parts of Europe was manifested before any of the prevailing views of prevention could have been applied, and which has, probably, not been materially disturbed, in one or other direction, since, by any of the measures which have been adopted in recent years; and that the remaining three-sixths of the decline of the total death-rate has been shared among the causes of mortality, for which particular methods of prevention, as applied to populations, have hardly been discussed."

The question now arises as to how much of the decline in the general and phthisis death-rates is due to migration. That the problem is one needing careful investigation is obvious. During the period 1861 to 1911 the population of the United Kingdom increased from 30 to 45 millions (that of England and Wales from 20 to 36 millions); during this period about 10 million natives of the United Kingdom emigrated to extra-European countries (6 millions English, a million Scottish and 3 millions Irish); during the same period some 40 million deaths occurred. It is clear that the figure for emigration—10 millions—representing as it does about one-quarter of the total number of deaths in the whole period—must be regarded as constituting a very disturbing element. There is, however, a large amount of immigration; but this,

so far as gross numbers are concerned, does not entirely counterbalance the emigration. In England and Wales the total loss of population by excess of emigration over immigration in the fifty years was upwards of one million (*see* Census Gen. Rep., 1901, p. 16). This million represents the difference between a net loss of some 6 million native population and a presumable gain of some 5 million foreigners. The assumption has commonly been made that the immigrants may be set off against the emigrants, and that the total effect upon the general and phthisis death-rates is thus a negligible one. Before acceding to this view it is necessary to have regard to the character of the incoming and out-going populations—(1) as regards age, and (2) as regards power of resisting disease.

(1) *The Ages of the Populations.*—This question has been discussed in detail in the General Census Report of 1901. Tables 18 and 19 show the excess or deficiency of the enumerated, as compared with the calculated, numbers of males and females at the different age-periods, at successive census enumerations. The results are considered at three groups of ages :—

(*a*) At ages over 55 the figures appear to be affected to some slight extent by balance of migration, but in any case, the effects of migration and of errors of all kinds so nearly neutralize one another that the extreme variation between the calculated and enumerated numbers does not exceed 1·26 per cent. of the former.

(*b*) At ages under 15, misstatement of age, in particular the tendency to return children at their age next birthday instead of their age last birthday, has undoubtedly operated ; but on throwing together the three five-year age-groups under 15 years, there is a total deficiency representing the balance of migration outwards, but this " is hardly likely to exceed the small fraction of 1 per cent. of the population affected."

(*c*) The age-groups from 15 to 55 in males and females alike, with the two exceptions, 20 to 25, and 25 to 30 in females, almost invariably show a deficiency of the enumerated numbers, representing a balance of loss by migration at these ages ; and the general conclusion may be formulated, therefore, that the age-groups 15 to 55 are predominantly represented in the figures relating to persons emigrating from this country. The striking exception presented by females 20 to 25, and 25 to 30 is examined at length in the Census Report, and the conclusion is reached " that a considerable number of females under 20 years of age have returned themselves as over 20, and that very large numbers

between 25 and 40 have understated their ages.   The following table is given :—

FEMALES : ON THE ASSUMPTION THAT THE RETURNS OF AGES ARE CORRECT, THE BALANCE OF GAIN OR LOSS BY MIGRATION IN INTERCENSAL PERIODS.

		1851-61	1861-71	1871-81	1881-91	1891-1901
All ages	...	− 42,099	− 52,143	− 59,917	− 201,224	+ 63,094
15-20	...	− 8,263	− 16,402	− 19,969	− 37,440	− 14,124
20-30	..	+ 113,414	+ 114,826	+ 119,224	+ 90,526	+ 167,882
30-40	...	− 133,076	− 128,536	− 126,814	− 158,790	− 100,060
40-50	...	− 4,267	− 6,882	− 4,021	− 19,074	− 9,810
All other ages		− 9,907	− 15,149	− 28,337	− 76,448	+ 19,206

The writers of the Report say : " An interesting puzzle for the curious would be to discover at what ages female emigration and immigration must take place in order to produce such results as these." They suggest that a solution of the problem is forthcoming if it may be assumed that " the whole of the emigration and immigration takes place immediately before a census " ; if, in fact, " the meaning of the term ' migration' be extended to cover transfer by incorrect statement of age, from one age-group to another age-group.   And this is un- doubtedly what has happened.   There has been migration (in the extended sense) from both of the age-groups 15 to 20 and 25 to 30 into the intermediate group 20 to 25 ; migration from the group 30 to 35 into the group 25 to 30 ; and so on, the process probably terminating not far from age 50."

There is, perhaps, room for scepticism as to whether the practice among females under 20 years of age of returning themselves as over 20 is so common as the writers of the Report suppose.   The thesis with regard to misstatement of age has been so enthusiastically defended by its formulators, that they have not paid much attention to the main conclusion to be drawn from study of their figures, they have, indeed almost failed to see the wood on account of the trees.   They themselves in commenting (p. 18) upon the apparent gain to the female population, over and above that due to the recorded natural increase, in 1851-61, 1861-71, and 1891-1901, say : " It should, however, be borne in mind, that no record exists of the amount of migration from time to time between Scotland and England and between Ireland and England, and it may, further, be noted that the enumerated population in England and Wales included 153,395 females born in Scotland and 201,598 females born in Ireland.   As the number of females born in England and Wales and enumerated in Scotland and Ireland did not exceed

68,072 and 31,880 respectively, the gain to the enumerated English female population under consideration may probably be due in great measure to this cause." If the writers of the Report had considered this probability in connexion with their observations concerning mis-statement of age, they would, it may be presumed, have laid rather less stress upon such supposed misstatement. They say, " Were the enumerated numbers correct, there must have been, in each intercensal period, a constant flow of young female emigrants, who would reach ages of between 15 and 20 years at the next census, and of older emigrants who would reach ages between 30 and 65 years of age ; and a stream of immigrants who would reach the intermediate ages 20 to 30." It may be contended that the known facts concerning drift from Scotch and Irish rural districts to this country rather support the correctness of the enumerated numbers upon which the writers of the Census Report cast doubt, and they at any rate somewhat mitigate the gravity of the sweeping indictment which they have brought against the female portion of the nation.

(2) *Disease-resisting Capacity.*—As regards the immigrant popula-tion, this subject has been a battle-ground of controversy for the past twenty years. Sir Shirley Murphy has investigated the subject in connexion with the alien population (mainly Polish Jews) in certain parts of Stepney, and again with the population in the Italian quarter in the neighbourhood of Saffron Hill. Both these inquiries yielded evidence that the disease-resisting power of the populations concerned was greater than that of persons of similar social status but of native origin. This was especially borne out when consideration was limited to phthisis, and in dealing with the Italian population the fact was elicited that the young Italians who emigrate to this country frequently, on becoming phthisical, return to their native villages and die there.

No such precise information is available with regard to the emigrant population. We have to remember, however, in the first place, that the ages at which phthisis prevails are broadly the emigrating ages ;[1] and that from time immemorial sea voyages and change of air have been prescribed for consumption. The emigrants, then, include many well-to-do invalids, and, further, many wage-earners, who have been advised to seek work in Australia, the United States, Canada, South Africa, or elsewhere. With regard to the former, it can only be stated

[1] The figures for Ireland show that in successive decades, from 1871 to 1900, 73·1 per cent., 75·9 per cent. and 83·7 per cent. of the emigrants were between 15 and 35 years of age.

quite generally that the total number of deaths from phthisis of natives of England and Wales occurring annually in various health resorts (in Switzerland, Southern Europe, North and South Africa, America, and elsewhere) probably runs up into thousands. During the last fifty years, moreover, increased facilities for travel have led, in numerous instances, to the sufferer from phthisis going farther and farther afield. But these declared invalids constitute only a comparatively small section of the population; the question which really interests us is this: Of the two million and more emigrants to British North America, of the five or six million to the United States, of the million and more to Australia and New Zealand, of the half-a-million emigrants to South Africa during the past half-century, how many, if they had remained at home, would have died here from phthisis?

That the number must at least be considerable will be realized by anyone who even cursorily investigates the extent to which those of whom he and his friends have personal knowledge die abroad. Thus, ten individuals who have noted the facts have supplied me with figures giving a total of 311 deaths, at ages 15 to 55, including 242 occurring in this country and 69 occurring abroad; there were in all 118 deaths from phthisis, 90 occurring in this country and 28 abroad. The figures are small, but they at least suggest that it would be profitable to extend this line of inquiry.

Some light may be thrown upon the question by study of international statistics. The general death-rates of European countries, with the exception of Roumania, Bulgaria, Servia, and perhaps Russia, show decline, and in this connexion the fact must not be lost sight of, that Europe has contributed upwards of 20 millions of emigrants towards the population of the North American communities. Mr. J. D. Whelpley, in "The Problem of the Immigrant," states that "in the earlier years the movement was from Germany, Scandinavia, Denmark, Holland, and France. . . . The people of other nations such as Italy, Austria, Russia, and Hungary then began to move." As long ago as 1860 France attempted, by legislation, to control the amount of emigration; Belgium followed in 1886, Switzerland in 1888, Germany adopted a stringent law in 1897, Italy in 1901, Hungary in 1903, and Austria in 1904. The Americans, on their part, have endeavoured to place some sort of restriction upon immigration, but it was not until 1903, when the existing Immigration Act came into force, that the question was treated very seriously.

Whatever effect may have been exerted upon general death-rates

by the large volume of emigration, there can be no question that a still more disturbing influence has been exerted upon phthisis death-rates. The emigrants have been to a preponderating extent persons at the phthisis ages, and not a few have emigrated for health reasons. During recent years many have, indeed, actually been sent back to Europe on the ground of ill-health. Thus Mr. Whelpley states: " During the past year (1904) about 8,000 aliens were refused admission to the United States after being brought to an American port, and they were sent back. Of those deported about 4,800 were paupers, 1,600 were diseased, and 35 were convicts." Particulars are, moreover, now coming to hand with regard to some of these deported cases. Again, there are the protests entered from the Colonies, from the middle of the nineteenth century onwards, as to the arrival of tuberculous cases (*see*, for example, *British Medical Journal*, August 10, 1912). The evidence under the above heads is mainly of recent date, and it relates, of course, only to advanced cases of the disease. It will be convenient to defer for the moment dealing with the question of statistical evidence from reports of the medical officers of health from colonial cities.

On examination of the phthisis death-rates of European countries it will be found that some of them, notably, for example, England, Germany, Denmark, Belgium, and the Netherlands, show a marked reduction; others, like France, Switzerland, Austria and Italy are more nearly stationary; while those of Ireland, Norway, and Hungary exhibit apparent increase.[1] If migration has played any considerable part in determining these changed death-rates, it cannot be mere quantity of migration that has been in question. The emigrant from a country which is increasing in prosperity will, it may be anticipated, differ in *quality* from the emigrant from a country whose prosperity is declining. Considered from this point of view, it will be noted that the European countries the prosperity of which has greatly increased, and from which there has been considerable emigration—those which might be expected, a priori, to have eliminated the least desirable and least resistant material—England and Germany, for example, are countries in which the decline of the phthisis death-rate has been especially marked. France and Austria, with their stationary

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[1] In the case of Norway the death certification was incomplete in the earlier years, and the figures for Hungary only go back to 1897. Figures are given by the Registrar-General relating to the Colonies of Australasia; these show, as a rule, some increase in the eighties, but general decline since. Figures are also given for Jamaica, Servia, Chili (practically stationary), and for Ceylon and Japan (marked increase).

populations, have stationary phthisis-rates; while Norway, Ireland and Hungary, with a large amount of emigration, accompanied by political unrest, show increasing phthisis-rates.

The suggestion that countries of stationary or declining prosperity are apt to lose their more enterprising and energetic inhabitants has been especially examined in relation to Ireland. The question was referred to in Dublin, in 1907, by several of the lecturers at the opening of the Tuberculosis Exhibition. The view taken generally was that emigration had had a great deal to do with the behaviour of phthisis in Ireland. Sir William Osler stated it as his belief that the most important single cause for the increase of tuberculosis was " the drainage from Ireland, by emigration, of the healthy." Sir Shirley Murphy referred to the important part played by emigration, and the need for studying its effect in relation to departure and return of both fit and unfit. The Irish official evidence was to a similar effect.

It will be convenient to defer dealing with special points raised by those who attach great importance to emigration in relation to phthisis, and to refer first to the objectors. Sir John Byers, Professor of Mid-wifery in Queen's College, Belfast, considered that there are serious scientific objections to the generally accepted view.[1] These are: (1) That in Belfast, which attracts the robust and strong, the death-rate from tuberculosis is high. (2) That Belfast also attracts persons between the ages of 15 and 35, and yet it has a high tuberculosis-rate. (3) That the Irish birth-rate has actually increased. (4) That " if the cause of the high tuberculosis death-rate in Ireland be the physical decadence of the people of Ireland, what must be concluded with regard to the condition of those who leave our shores for America ? " The Irish in America, it is argued, have a high death-rate—" those who emigrate are no better than those who remain behind." (5) That Belfast has suffered least from emigration, and yet its phthisis death-rate is high. (6) That " in a recent examination of recruits the smallest number of rejections was among the Irish." (7) That, as pointed out by Dr. Newsholme, " in the past it was the small farmers, the cottiers, and the labourers who emigrated in the largest numbers, and these, owing to their extreme poverty, must have been among the least fit."

It is not now practicable to make detailed inquiry into the special circumstances of Belfast. A number of interesting problems arise in

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[1] " Ireland's Crusade against Tuberculosis," vol. i, p. 65, and " Why is Tuberculosis so Common in Ireland ? " *Lancet*, 1908, i, p. 210.

this connexion, but they are those of a large city increasing in prosperity and in population, and presenting occupational and other peculiarities which undoubtedly overshadow the influence of emigration.

Comparative Birth Rates. England, Scotland and Ireland.

ENGLAND + + + + + + +

SCOTLAND - - - - - - - - - - -

IRELAND ——————

Margin of Variations between highest
and lowest rate (1881-1906).

England.	6·9 per 1,000	-	20·4%
Scotland.	5·8 „ „	-	17·2%
Ireland,	2·2 „ „	-	0%
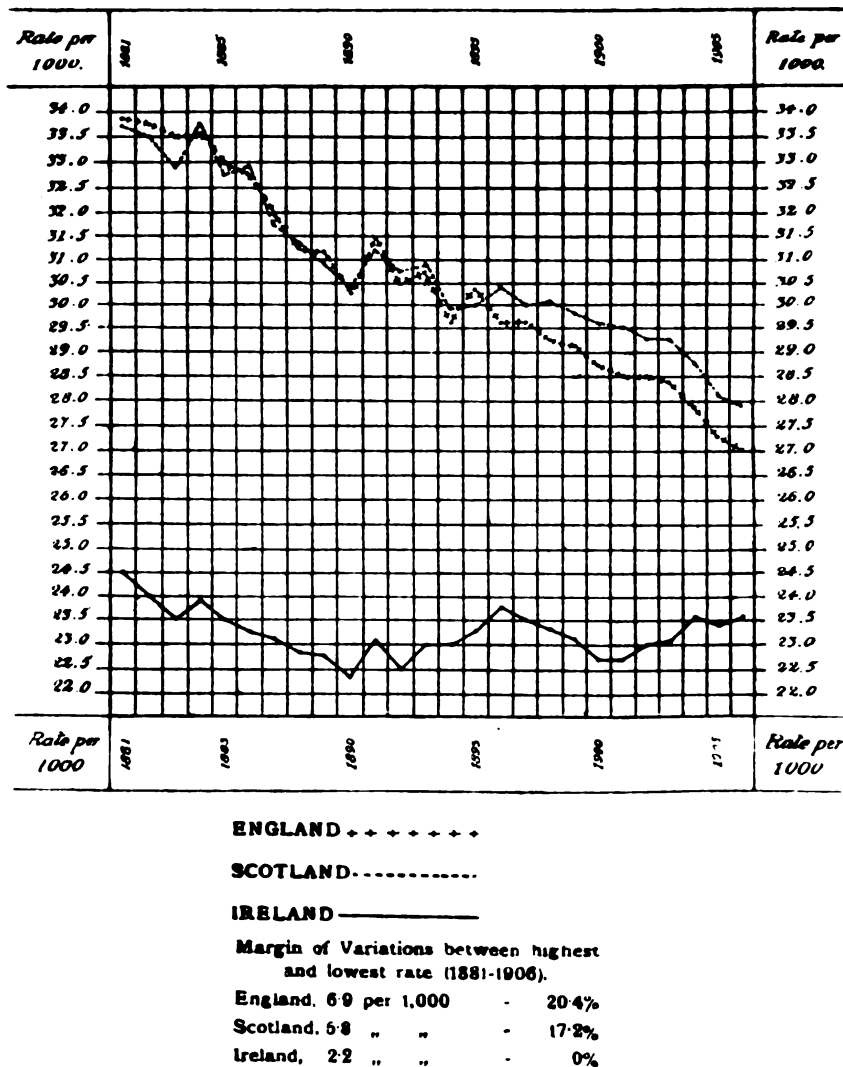
DIAGRAM VI.

(Diagrams VI, VII and IX are reproduced from diagrams in " Tuberculosis in Ireland.")

The fact that Belfast is exceptional really favours the conclusion that the rule, formulated with regard to the rest of Ireland, holds good. As to the argument from the birth-rate, little weight can be attached to it.

During the decade 1881-90 the Irish birth-rate was declining; since 1890 it has shown slight recovery (diagram VI). If importance be attributed to this increase, it may be urged that Dr. David Heron has shown[1] that in every case (save cancer) there is "a positive correlation between an undesirable social feature and a high birth-rate, and a negative correlation between a mark of a well-to-do population and the birth-rate." As regards the *recent* examination of recruits, and the *early* emigration of the cottiers (for it is to the emigration following upon the famine of 1847 that Sir J. Byers presumably more especially refers), these do not throw any direct light upon the question of an apparent rise in the phthisis death-rate in the late sixties and seventies.

The point raised with regard to the Irish in America is, however, an interesting one, and it must here be carefully considered, for some importance has been attached to it by American statisticians. The case has been concisely set out by Dr. Newsholme in his book, "The Prevention of Tuberculosis" (pp. 218, 219). After stating that he does not lay stress on such points as the birth-rate and the cottier question already mentioned—for, as he says, "these considerations are to some extent inferential"—he proceeds, "It is possible to settle the question definitely by actually following the emigrated population and comparing their susceptibility with that of the residual Irish." He quotes the high Irish phthisis death-rates in the American Census Report for 1900, but these, he notes, are uncorrected for age-distribution. He turns, therefore, to the vital statistics of the City of Providence, Rhode Island, and cites Dr. Chapin's figures, "which enable a corrected comparison to be made." . . . "The death-rates from phthisis in Ireland in 1901, for sex- and age-periods, were," we are told, "applied to the population of Providence, in 1900, born of Irish mothers. It was found that the theoretical mortality from phthisis of this element of the population (of Providence) according to these (the Irish) data, was 258 per 100,000 living. The actual rate for the period 1896-1905 was, however, 339. The mortality from phthisis of the Irish in Providence is, therefore, 81 per 100,000, or 31·4 per cent. more than the mortality of the Irish in Ireland."

The American Census statistics relate, as is well known, to a portion only of the United States, comprising mainly urban populations, and thus including the poorest inhabitants of the large American cities. This is a more serious matter than the question of age-distribution.

[1] "The Relation of Fertility in Man to Social Status," 1906.

Further, the Irish population of Providence only numbers a few thousands; the city in 1900 had, in all, only 175,597 inhabitants. Table xviii of the City Registrar's Report for 1906 shows that of the 5,456 births in that year, 628, or 11·3 per cent., were births of Irish mothers, and in 494, or 7·9 per cent. of the births, the father's birthplace was Ireland. The constitution of the population has, moreover, greatly altered in the last sixty years, for in 1856-60, in 43·11 per cent. of the births the father's birthplace was Ireland, but this percentage had fallen in 1906 to 7·50. We have to deal, therefore, with quite a small population, and one disturbed in a marked manner by migration. Further, prior to 1911, no correction was made for outlying institutions, and Dr. Chapin writes, in that year, "the figures formerly given of the number of deaths from pulmonary tuberculosis in Providence were misleading."

The analysis by the Census Office of the deaths at ages from phthisis in the registration area of the United States, however, broadly confirms the above results. An important fact is brought to light by the figures for Boston which, like other large cities, shows excessive incidence upon the Irish population. According to the census of 1900,[1] 31 per cent. of the population had mothers born in Ireland, but no less than 36·5 per cent. of all deaths were of those having mothers born in Ireland. In 1910 this percentage had declined to 32·8 per cent., although "it seems probable that this (the Irish) division of the people still maintained its 31 per cent. of the City's population." The rate for pulmonary tuberculosis "among those having mothers born in Ireland," for the age-period 30 to 35 years, was more than twice those of the English, Scotch, and native Americans. The deaths in the decade 1900-10, however, fell "from 653 to 490, a decrease of 25 per cent., a most excellent showing; though, even in 1910 the 490 deaths represent 45 per cent. of all the deaths from pulmonary tuberculosis, indicating that the Irish are still unduly handicapped by this disease." The writers of the *Bulletin* are at a loss to account for the high rates among the Irish, though, they say, "the severe winters and the excessive use of alcohol are undoubtedly important factors." The marked discrepancy between the rates in 1900 and 1910 is especially noteworthy, and suggests the possibility that the application of the deaths to the population may be attended by some serious source of fallacy, and further that

[1] *Monthly Bulletin* for May, 1912, i, No. 5.

variations in the volume of Irish emigration may have to be reckoned with.   •

It is clearly unjustifiable to apply statistics relating to the Irish in Providence, or to the Irish in Boston, to the whole Irish population of America; or to compare the population of Providence or Boston with the residual Irish in Ireland. Dr. Newsholme has told us that "in every country town life has been associated with a greater prevalence of tuberculosis than has country life" (loc. cit., p. 223); and this despite the fact that "the towns attract the robust and strong, while the weakly tend to remain in and return to the country districts." If urban statistics could be corrected for these last-mentioned circumstances, the extent of the mischief wrought by the towns would, he says (p. 221), "be exhibited more strikingly, and even more accurately."

There seems to be no doubt that America has, to a large extent, played in regard to Ireland the part assumed by the towns in relation to rural districts in other countries, and the four million emigrants, between 1851 and 1910, must in such case have included a large proportion of the more fit, and presumably the more resistant, to disease. The phthisis death-rates among the Irish in the American cities, if they are to be weighed in the balance, should, moreover, at any rate be compared with the corresponding rates among the Irish in the cities of Ireland, and not with those in Ireland as a whole.

If like be compared with like, the case for an "original racial tendency to tuberculosis" is unconvincing. The writers of "Tuberculosis in Ireland" are definitely of this opinion, and they refer to the favourable rates from phthisis in Ireland, at the lower ages, as having a bearing on the question (p. 39). O'Farrell and Courtenay, however (cited by Bulstrode, p. 83) think that "just as the Irish famine was, apart from its direct effects, responsible for so much physical disease in the country," so, it may be, "innutritious dietary, and other deprivations," may have acted upon the nervous system also—in other words, increase of phthisis and increase of insanity alike, in recent years, are, they consider, an ultimate outcome of the famine and succeeding epidemic prevalences. It is scarcely likely, however, that these effects could have left their mark upon the second and third generations, and have had no influence upon the first; and yet this is what we are asked to believe. It will be remembered that the recorded phthisis death-rates, prior to 1864, represent the low level from which the apparent rise of the seventies and eighties was manifested. The two writers quoted are, therefore, on

the horns of a dilemma. If they advance racial degeneration as a cause of increase of phthisis, they must repudiate reliance upon the early death-rates; if, on the other hand, they recognize that these early rates are understated, the apparent rise of phthisis in recent years disappears. As Professor Lindsay, of Belfast, says, "we must not admit that the Irish race have any racial tendency to tuberculosis"; and he adds that if certain individuals in America suffer beyond the average of other races, "we should be inclined to blame, not exactly their racial characteristics, but rather the conditions of life under which they live in the United States of America."[1]

The Irish witnesses, as a whole, then, deny an original racial tendency to phthisis. They, however, are inclined to admit loss by emigration of the fit. On the other hand, Dr. Newsholme, while he agrees that this last-named opinion is widely held, himself strongly opposes it (p. 217). He relies mainly on the arguments from the death-rates in American cities, which have already been referred to; but he also lays stress upon the improvement which he urges has been manifested in the social condition of Ireland in recent years. Thus he quotes Tables liii and liv, from a Report by Mr. Wilson Fox, which make comparison between the wages of agricultural labourers of England and Wales, Scotland, and Ireland; these tables show, it is true, that during fifty years wages in Ireland have increased, but they forcibly illustrate, at the same time, how notably the average wage in Ireland comes short of that in other parts of the United Kingdom. Again (loc. cit., p. 227) extracts are given from a paper by Sir R. Matheson, indicating that "the material improvement in the housing of the people of Ireland, since 1841, is very satisfactory, but that there is still much to be accomplished." Fig. 19, on p. 227, of "The Prevention of Tuberculosis" shows, however, that the changes held to indicate the improvement in question took effect in the main prior to 1861, and they were, doubtless, due, as Sir R. Matheson has pointed out, to the depopulation caused by the famine and succeeding epidemic prevalences. "Everywhere," as Sir Robert says, "throughout the west and south of Ireland, vast numbers of (these little) habitations were left desolate, the inmates having either perished from the famine or the fever, or sought refuge from their misery in emigration." Dr. Newsholme, on the whole, concludes (p. 250) that "the economic condition of Ireland has not become worse, and that so far as can be measured by the tests

[1] Ireland's Crusade against Tuberculosis," vol. i, p. 108.

already given, it has improved. . . . Food has become cheaper, rents are low, overcrowding has declined, and is less marked than in Scotland." On the other hand, Mr. W. P. O'Brien, one of the Assistant Commissioners to the Royal Commission on Labour (vol. iv, p. 245), says, "It will probably be accepted as a fairly well established position, that in few, if any, of the countries with the affairs of which we are conversant, has the condition of the class of agricultural labourers in regard to house accommodation ever been known to sink to a lower level of general wretchedness than that very largely reached in Ireland in even modern times."

It is necessary to keep constantly in mind the fact that the observed rise in the phthisis death-rate of Ireland dates from 1864 (the year of inauguration of compulsory registration), and if we incline to regard it as representing a real, and not a mere apparent rise, and desire to correlate it with various social conditions, it is to the Ireland of the sixties to the eighties, and not to the Ireland of the present time, that we must turn. The conditions obtaining in the north and west of Ireland, then, at any rate, were most unfavourable. Dr. J. Stewart Mackintosh[1] has given a graphic description of the state of affairs in the west, " in the notorious congested districts, groups of cabins dotted haphazard over the country side, and inhabited by listless scarecrows clad in rags of rags. Here famine and pestilence hold perennial sway, and only those who have seen the full development of these plague spots in the remoter promontories and peninsulas of Connaught can believe that such places could exist within the confines of the British Isles." "One thing alone," he says, " stirs the breasts (of the people) with hope—the sound of the Atlantic tides that ebb and flow about their coasts. Beyond it are cousins, brothers, sons, who have managed by hook or by crook to cross the sea." And then, he adds, "Have these gone to swell the ranks of the inefficient in other communities? On the contrary, the New World has drawn some of its most hard working labourers from among them. . . . Men who develop a surprising physique and energy as soon as they can enter environmental conditions at all conformable to their physical needs."

One of the difficulties in dealing with Ireland is the great uncertainty as to the value of the statistical records. Dr. Newsholme, as has been seen, originally sought to avoid the migration difficulty by directing attention to national statistics; but by a curious irony the

[1] *Brit. Med. Journ.*, 1912, ii, p. 370.

main battle-ground, in the argument raised by him, proves to be Ireland —for that country constitutes, as he believes, an exception in the matter of phthisis isolation, from which he seeks to prove his rule as to the influence exerted by segregation. It is upon Irish statistics, then, that the light is chiefly focused. In attempting to avoid the migration difficulty, we are thus obliged to concentrate attention upon a population which has lost nearly four millions by emigration within living memory, and with a view to escaping statistical error we are instigated to study figures which, beyond almost any others we know of, need to be treated with circumspection and reserve.

The early phthisis-rates are unquestionably understated. Sir R. Matheson says that, up to 1864, there is no doubt the figures are " considerably under the truth." For some years succeeding 1864 they are much lower (*see* diagram VII, which is a reproduction of a chart in Dr. Bulstrode's Sanatorium Report) than those of England and Wales and Scotland, and this is quite at variance with all we know of the social condition and degree of prosperity of the several populations in question. The Irish vital statistics and records of pauperism are, moreover, well known to be far less reliable than those of the other two countries. Dr. Newsholme thinks (loc. cit., fig. 30, and pp. 249 and 250) the Irish pauperism of the last thirty years overstated ; " change in administration must have produced an increased number of paupers for a given amount of destitution." But the recorded Irish total pauperism is, even now, only about the same as the Scotch, and rather less than that of England and Wales, and it is, of course, impossible to accept the view that the Irish poor are better off than those of this country. Dr. Newsholme, indeed, speaks (loc. cit., p. 217) of the " undoubted general poverty " of Ireland. Again, he agrees (p. 250) that the earlier as well as the latter part of the Irish curve of pauperism stands in need of adjustment.

It is clear, therefore, that comparison cannot satisfactorily be made between the Irish phthisis death-rates of an earlier and a later period, or between Irish, and English and Scotch phthisis death-rates ; and, again, that comparison cannot safely be instituted between the recorded Irish pauperism of an earlier and later period, and between Irish pauperism and English and Scotch pauperism. In such a maze of difficulties it is hazardous to attempt to deal with "proportional figures" and " segregation ratios." It is much safer to study the actual rates, and one fact must clearly be realized from examination of these— namely, that the ratio of indoor pauperism per 1,000 of the population

N—10

has remained practically stationary in all three countries, and has throughout been highest in Ireland. It has, indeed, been suggested (loc. cit., pp. 282-84) that there are certain differences between the Irish and English character, which lend support to the view that " institutional segregation " is of " lower specific value " in Ireland than in England. But even if this were the case, the peculiarities referred to have presumably obtained throughout the entire period, and the fact, if established, could only tend somewhat to reduce the value of institutional segregation in Ireland throughout the whole time of observation. It cannot, however, be contended that it would reduce it, say, below that of Scotland, for which the records show only one-fourth the indoor pauperism of Ireland. Yet in Scotland recorded phthisis has diminished while in Ireland it has increased. If any value at all is to be attached to the comparison between the two countries, it is quite clear that the efficiency of institutional segregation has not had any appreciable influence upon phthisis-rates, for Scotland with less segregation shows marked decline, while Ireland with more segregation shows slight increase.

There is the further consideration that if it be argued that the institutional segregation of phthisis in Ireland has diminished in efficiency down to our own time, it must be held that on going backwards there should be notable improvement in this respect. Did time permit, the impossibility of making such admission might be illustrated at length from the official records. Some conception of the conditions obtaining in Ireland in the early days may perhaps best be obtained from study of the recent Report of the Poor Law Commissioners. They quote the Census Commissioners of 1851, who in commenting upon the decennial decrease of 1,622,739 in the number of inhabitants, point out that the population on March 30, 1851, should have numbered 9,018,799 instead of 6,552,385, and that consequently the loss of population between 1841 and 1851 may be computed at the enormous amount of 2,496,414 persons. The Royal Commission Report of 1909 adds, " These figures show that two and a half millions of persons *have to be accounted for*. Of these the number that died of starvation, and of fever and dysentery consequent on starvation, is estimated at over 1,000,000. Emigration, which was very active during those years, carried away the remainder. But disease followed them into the emigrant ships, and even to their homes in the new country, and about 20 per cent. of the emigrants died." These, then, were the days of comparatively low and undoubtedly understated phthisis death-rates in
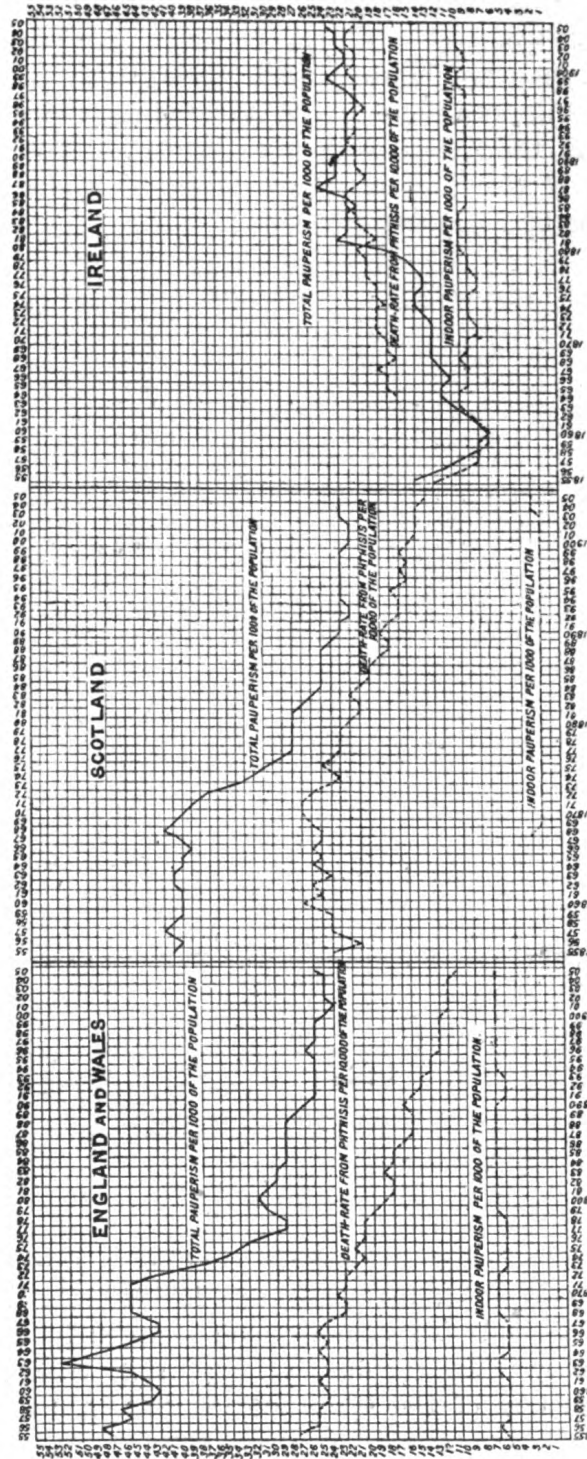
DIAGRAM VII.

Ireland; we clearly cannot accept the view that they were also days of efficient segregation.

Of course, the main difficulty with regard to the Irish figures is the huge volume of the emigration. The annexed table gives the particulars extracted from the successive census returns. From 1841-61 there was a decline of nearly 2½ millions; from 1861-1911 there has been a further decline of nearly 1½ millions.

		Population		Decennial decrease			Per cent.	
1841	...	8,175,124	...	Increase	407,723	...	Increase	5·25
1851	...	6,552,385	...	Decrease	1,622,739	...	Decrease	19·85
1861	...	5,798,967	...	,,	753,418	...	,,	11·50
1871	...	5,412,377	...	,,	386,590	...	,,	6·67
1881	...	5,174,836	...	,,	237,541	...	,,	4·39
1891	...	4,704,750	...	,,	470,C86	...	,,	9·08
1901	...	4,458,775	...	,,	245,975	...	,,	5·23
1911	...	4,381,951	...	,,	76,824	...	,,	1·7
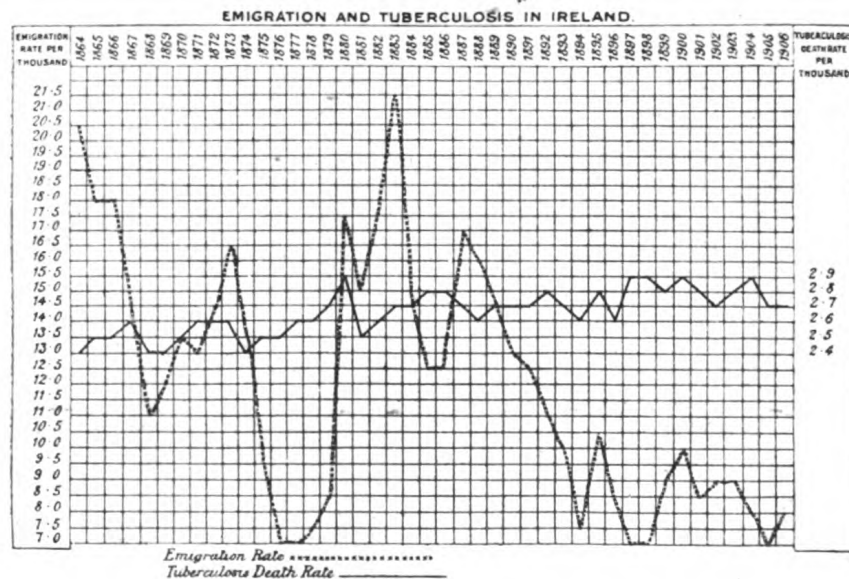
DIAGRAM VIII.

From May 1, 1851, to December 31, 1910, the Irish emigrants numbered 4,187,443. To obtain an approximately true measure of phthisis mortality in Ireland during the last sixty years we need to take account not merely of the 6,552,385 in 1851, and of those born in Ireland since 1851, but also of the 4,187,443 emigrants and their

descendants. The numbers of the last named and the deaths occurring outside Ireland cannot, of course, be ascertained. The difficulty has always been glossed over by assuming that the effects produced by

Comparative Death Rates, England, Scotland and Ireland.
Deaths from all causes.

ENGLAND + + + + + +

SCOTLAND - - - - - - - -
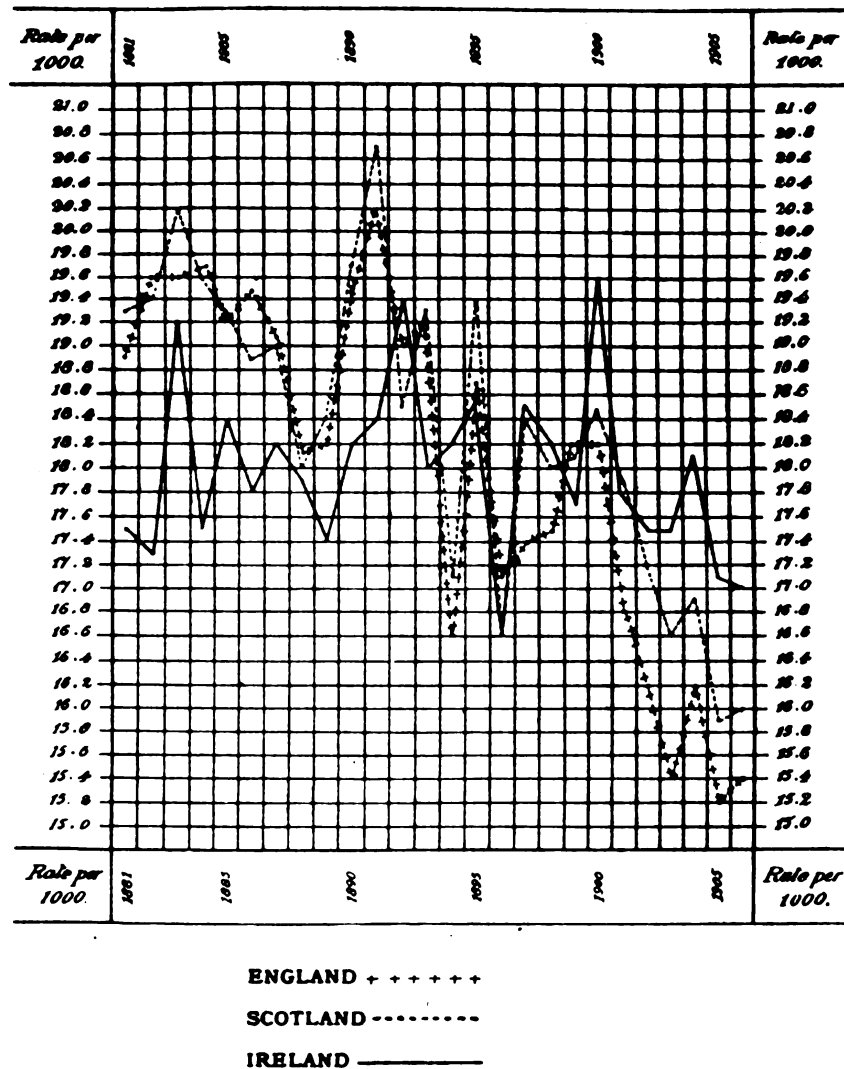
IRELAND ————

DIAGRAM IX.

emigration and immigration balance one another. This is an entirely unsafe assumption where emigration has taken place upon the scale exhibited in Ireland. Obviously a great deal turns upon the ages of

the emigrants, upon their quality as regards resistance to disease, and upon the ages and conditions as to health of such of them as return to their native country.

Sir R. Matheson, writing officially as Registrar-General, said, " Emigration has removed the able and healthy, and thus left amongst the residue an increased percentage of the enfeebled and persons less able to withstand the attacks of disease." He lays stress, moreover, on the fact that the Irish death returns are swelled by " returning Irish Americans " and by " migrating labourers " from England. He gives details on this point in his paper (loc. cit., vol. i, pp. 34 and 35). In the official report on " Tuberculosis in Ireland " we read, " An appreciable number of our emigrants who suffer from slow wasting diseases such as consumption return to Ireland to die." The writers of this report further say, " As a rule the healthiest and most intelligent member or members of the family are selected to go forth. . . . The steady drain upon the youth of the country, male and female alike, . . . may be regarded as a possible contributory cause to the death-rate from consumption." They add, however (p. 50), that if emigration had caused deterioration of the race it should " equally affect the general death-rate "; and that the country districts should suffer more than the towns, " seeing that the greater portion of the emigration is from the rural districts." As regards the general death-rate, comparison of the rates of Ireland, and England and Wales and Scotland, reveals the phenomena this theory would lead us to expect (diagram IX). As the Report itself states (p. 6), in commenting upon the general death-rate, " Ireland has not shared in the remarkable reduction of mortality that has taken place in England and Scotland." As regards the rural districts, the mortality from phthisis is higher than in rural districts in this country, though it is notably less than in the Irish towns. The particular case quoted (Mayo) is certainly, on a first view, paradoxical. It is a "typical congested county," and yet its phthisis death-rate (1900-02) was only 1·64 per 1,000. We have to remember, however, that Mayo is a county from which emigrants to America have been very largely drawn in recent decades; and, further, it supplied between the years 1894 and 1903, 20,000 migratory labourers annually out of a total population of approximately 200,000, for the harvesting in England and Scotland. These labourers leave Ireland from the middle of February onwards, " many not returning until a week or two before Christmas " (Board of Trade Report on " Migratory Labourers "). Unless suitable correction can be made for the great disturbances of the figures which

must result from such a wholly abnormal condition of affairs as this, no great importance can be attached to the Mayo phthisis death-rate.

Those who do not agree that, on the whole, it has been the fit who have emigrated, and who therefore hold that no appeal can be made to
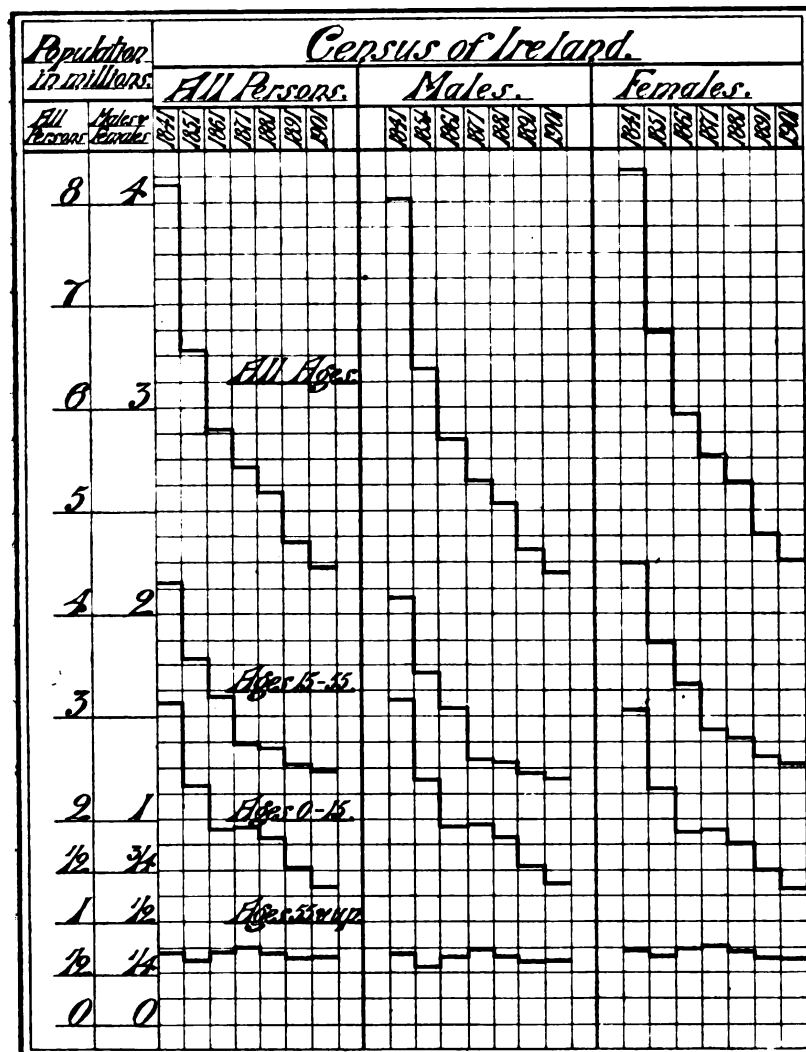
DIAGRAM X.

reduction of disease-resisting capacity, have still to deal with the influence exerted by emigration upon the age-distribution of the residual Irish population. "Emigration," says Dr. Newsholme (p. 212), "has altered the age- and sex-distribution of the population by removing a large part of the young and middle-aged, among whom most deaths from phthisis occur; and when the figures are corrected for age- and sex-distribution, the true increase of phthisis, on the assumption of constant age- and sex-distribution, is seen to be really larger than the figures show." There is room for much misunderstanding here, for it is necessary to distinguish between correcting for the Irish age- and sex-distribution at a later by comparing it with that at an earlier period, and making correction by comparing the Irish distribution with that of some other country. Presumably the last-named comparison is in question at the bottom of p. 212, and the former at the top of p. 213. Moreover, readers of the sentence at the top of p. 213 may be misled, as there is apparently some misquotation here. The phthisis death-rate in 1891 is given as 19·3, as compared with 21·5 in 1901. The former rate should be 21·34. But the important point is that this rate is not lowered but raised by correction to 22·13, and it then, therefore, exceeds the rate for 1901 (21·42).

The facts as to varying age-distribution at successive census enumerations are illustrated in the accompanying diagram (X). In immediate succession to the exodus following upon the famine, the proportion of population at the phthisis ages (15 to 55) may be assumed, following Dr. Newsholme, to have declined; but during the last forty years, in which we have, in fact, to deal broadly with a declining amount of emigration the percentage has risen. Instead, therefore, of abnormal age- and sex-distribution tending to diminish the phthisis death-rate, it has in recent decades had the contrary effect. The proportion of persons aged 15 to 55 to total population has actually increased, during the last forty years, from about 50 to about 54 per cent.—an increase which nearly corresponds with the recorded increase in the phthisis death-rate. The diagram shows, in the case of both males and females, a falling off in the numbers at ages 15 to 55 to an extent corresponding with the fall at all ages up to 1871, but since then the numbers at ages 15 to 55 show less marked falling off. It will be remembered that the recorded increase in phthisis occurred in the seventies and eighties.

If the population for 1901-10 be taken as the standard, and its death-rates applied to the other populations, the following results are obtained :—

IRELAND.—PHTHISIS.

Decennium			Standard death-rate			Factor for age and sex correction
1841-1850	...	...	19·63	...	...	1·02955
1851-1860	...	...	19·83	...	...	1·01916
1861-1870	..	...	19·48	...	..·	1·03747
1871-1880	...	...	19·04	...	...	1·06145
1881-1890	...	...	19·31	...	...	1·04661
1891-1900	..	...	19·92	..	...	1·01456
1901-1910	...	...	20·21	...	...	1·00000

Applying the factors to the recorded decennial rates we have the following average annual death-rates per 10,000 :—

IRELAND.—PHTHISIS.

Decennium			Average annual death-rate		Factor		Death-rate per 10,000
1871-1880	...	...	19·5	...	1·06145	...	20·70
1881-1890	...	...	20·9	..	1·04661	...	21·87
1891-1900	...	...	21·3	...	1·01456	..	21·61
1901-1910	...	...	·20·21	...	1·00000	...	20·21

Thus phthisis in Ireland, judged by a *corrected rate*, has actually declined in the last thirty years.

In summary it may be stated, therefore, that Ireland, instead of showing the marked decline observed in England and Wales and Scotland, shows a slight rise which commenced with the institution of compulsory death registration; and this has been followed in the last thirty years by a decline; again, upon the whole, the phthisis death-rate for the last fifty years has been practically stationary. The explanation of this behaviour is to be sought partly in the fact that the deaths for the earlier decades in Ireland are underestimated, and partly in the disturbance introduced by migration—this latter including over and above alterations of age constitution, a lowering of the disease-resisting power of the residual population, and an increase due to the addition of a certain number of deaths of returned emigrants.

The case of Ireland has been investigated at length because of the light it throws on emigration generally. Turning now to take a more extended view, it is in the first instance important to bear in mind the fact that in dealing with phthisis-rates consideration is, perforce, always limited to areas of death registration, for there are no reliable figures relating to the outlying regions to which emigrants from civilized countries have resorted.

Speaking of the United States of America as a whole, Hirsch said, thirty years ago, phthisis " has increased in a marked degree of late years in many parts." He also referred to increase of phthisis in

Australia, and stated that, in Melbourne, the death-rate rose (1865-69) from 2·22 to 2·52 ; he quoted, moreover, the works of Thomson and Reeve, which illustrate the apprehension felt on this subject in Australia in the seventies ; and he cited the paper[1] in which Hall states that, during five years' practice at Hobart, there were 235 deaths from phthisis, only 37 of whom had been born in the Colony, all the rest being immigrants from Europe.

A few of the recent reports of medical officers of health give more detailed information. Thus Dr. A. J. Anderson finds that nearly one-third of the deaths among Europeans dying in Cape Town occurred among persons who had been less than four years in the City (14 out of 60 had lived in Cape Town less than one year). Again, Dr. Porter gives a table (p. 26, Report of 1912) relating to 208 British-born immigrants in Johannesburg, dying between July 1, 1907, and June 30, 1911. He finds that 79 of these " were infected before arrival in South Africa." Judging by these figures it would appear that in the whole of South Africa there must be several hundreds of deaths annually of persons who have left the British Isles only a few years previously.

I am indebted to Mr. Robert Cross, Actuary of the Atlas Company, for some particulars which he has obtained for me from Mr. Crum, Assistant Statistician of the Prudential Society of America. Mr. Crum writes, " Very few of our cities report the deaths by nativity and specific cause of death. In New York City, out of 1,548 cases of tuberculosis treated, 711, or 45·9 per cent., were natives born, and 837, or 54·1 per cent., were foreign born. As regards migration of consumptives from one State to another, we may say certain Western States, such as Colorado, Nevada, Idaho, Utah, and certain southern and south-western States, such as North Carolina, Arizona, New Mexico, and Texas, have been for many years objective points for consumptive health-seekers. Colorado, particularly, has secured the larger share of such patients." Mr. Crum adds, " With the exception of Colorado, the States mentioned as being objective points for consumptive patients do not have a thoroughly well organized registration system, and their · mortality returns are not complete or reliable, and in fact most of the States do not issue any State Health Reports." He further quotes statements as follows : . . . " Salt River Valley of Arizona, with a winter population of 15,000 ; 33 per cent. were health-seekers, of whom fully four-fifths were incurable." . . . " The death-rate from tuberculosis in North

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[1] *Trans. Epid. Soc. Lond.* (1862-63), 1867, ii, p. 85.

Carolina during 1910 was 271·6 per 100,000 of total population." . . . " In the City of Denver during the period 1893-98, 84·1 per cent. of the deaths from tuberculosis were of non-residents as against 15·9 of residents. For the years 1905-09 the average number of reported cases among non-residents was 87 per cent. of the total."

Unfortunately, whatever may be said as to the imperfection of the United States vital statistics applies with even greater force to the earlier statistics of Australia, New Zealand, Canada, and South Africa; while it is practically impossible to trace deaths occurring in such places as Egypt, Madeira, or the Islands of the Pacific. Our own death records must be depleted of many thousands of entries annually if there be added to the total number of deaths of invalids, at the various health resorts outside this country, all the deaths from phthisis, of natives of the British Isles, occurring in Canada, Australasia, South Africa, India, &c., &c., or on the sea itself. Practically all these deaths, had it not been for development of the use of health resorts and of modern facilities of travel, and for the great growth of emigration, would have been registered in this country.

We cannot fail to note, moreover, that the period of declension of phthisis in civilized lands corresponds with that of increase of facilities of travel. This subject is perhaps deserving of further examination. Thomas Young, in the second book of his "Historical Treatise on Consumptive Diseases," has given a full account of the growth of opinion with regard to change of air; an account, which he tells us, we owe to his having had access to the Library of the Medical and Chirurgical Society. From the earliest times the value of sea voyages was recognized, for example, by Aretæus and Caelius Aurelianus. Then there is the well-known aphorism of Celsus, "the worst air for any disease is that in which it has originated." Celsus held that a long voyage was advisable, " if the strength allowed it, and Alexandria was generally to be preferred; though a shorter voyage might be tried if the strength was much reduced; or the motion of a coach or chair."

Pliny recommended "pine woods, a voyage to Egypt, or a course of milk in the mountains." The advantages of sea voyages have been fully examined in an essay by Dr. Gilchrist. This writer attributed considerable benefit to the action of vomiting, which he said "improves the tone of the stomach and bowels and is a powerful deobstruent "; and it was, perhaps, with some such idea as this in his mind that Sydenham advised horse exercise. It is true he recommended *long journeys*, but they were to be " on horseback, the patient was to take

care to have his linen well aired, and to continue his journey long
enough, the longer as he is the more advanced in life." Carriage
exercise was "not by any means to be despised, though not equal to
riding." Morton relied upon "the chalybeate waters, as those of
Islington." Mead advocated "a change of climate, a voyage to Lisbon
or to Naples, riding or carriage exercise." Thomas Young refers to
some curious recommendations—e.g., that of Clapier, "living some time
in a coal-mine," or that of Read, "residence in a cow-house." Erasmus
Darwin advocated the production of nausea, not, as recommended by
some, by sea voyages or swinging, but by "the rotatory motion of a
chair properly suspended by a rope and turned thirty or forty times
round." Fothergill puts in the forefront "Bristol water,"[1] adding
that "the journey and the cool morning air may co-operate with its
virtues." For the winter, he says, "We may choose Camberwell,
Peckham, the lower parts of Clapham, the drier parts of Lambeth,
Battersea, Fulham, Chelsea, Brompton, or Kensington, and more
elevated situations, such as Buxton and Matlock, for the summer." He
also mentions the South of Europe and Madeira. Rush, in 1793,
recommended a voyage across the Atlantic; and Thomas Young himself
(writing in 1815) advised, in addition to the South of England (Devon
or Cornwall), the South of Europe (Lisbon, Montpelier and Italy), the
islands of the Mediterranean, Madeira, or even the West Indies.

It will be seen how, up to this point, the sufferer from phthisis
was only exceptionally sent far away from home : but during the course
of the nineteenth century there came the great increase in the facilities
of travel, and the sea voyage, instead of being only to Naples or
Alexandria, was now to the other side of the world—e.g., to Australia
or the Pacific. There was, moreover, notable development, particularly
in the latter part of the century, of the belief in pine woods and the air
of high altitudes, and the patient was advised to go to far-distant
mountain districts and high tablelands. The individual sufferer who
was sent for a sea voyage in the times of Celsus or Pliny was, doubtless,
as subject to risk of dying away from home as he who was sent the
far longer distances of recent years ; but the visit to Alexandria must
have been quite an exceptional event, whereas thousands of phthisical

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[1] Thomas Young notes the high mortality from consumption in Bristol, "and yet," he
says, "as if in defiance of experience, this very place has been chosen as the great resort of
consumptive persons." In his own case he adds, "the symptoms originated in a very pure
air in a very healthy part of Hertfordshire, and subsided principally during a residence of
some months in Red Lion Square, surrounded by closely built streets."

people have been sent to the remote parts of the earth in the last half-century.

In summary of the available statistical evidence for the past fifty years, it may be stated that, between 1861 and 1911, the number of deaths from phthisis annually in England and Wales has declined from some 50,000 to less than 40,000, the death-rate having diminished from about 25 to 11 per 1,000. There can be no question that altered nomenclature is responsible for a considerable portion of this decline, indeed, we should probably not be far from the mark in assuming that the yearly number of deaths from pulmonary tuberculosis has remained, throughout the fifty years, very nearly stationary. During this time the population has rather more than doubled, and if all those becoming phthisical had stayed at home and died in England and Wales, and if no real " declension of phthisis " had occurred, the total number of deaths recorded annually would now, other things remaining equal, be rather more than 70,000 instead of less than 40,000. A considerable but unknown number of thousands of deaths, however, occurring each year abroad, should be added to the 40,000 deaths. Another way of putting the case would be to say that if, in addition to making allowance for altered nomenclature, account be taken of the influence exerted· by migration, it becomes necessary to realize that a presumption is raised that quite a considerable percentage of the apparent decline in the phthisis death-rate will, then, have been sufficiently accounted for.

Migration, then, not only throws much light upon the problems presented in the Sussex villages, but also upon similar difficulties encountered in dealing with Irish statistics; and, further, it must be held responsible for some considerable share in causing the decline in the phthisis death-rate of England and Wales. But a hypothesis must stand or fall, not by its explaining the phenomena it was invented to explain, but by its power of elucidating other phenomena. The following considerations present themselves, on a first survey of the situation, as deserving of notice in this connexion :—

(1) An assumption that countries in which material prosperity is rapidly increasing tend to throw off, by emigration, the less resistant portions of the population; while countries in which, for one or other reason, there is unrest, and almost stationary or even declining prosperity, tend to throw off the more resistant portions of the population— would go far towards explaining the dissimilarities in the recorded phthisis death-rates of the various civilized countries in the last half-century.

(2) The remarkable tendency for the age-periods showing highest incidence of phthisis in England and Wales to shift in the direction of the higher ages during the last three or four decades[1] is a fact which has been found difficult of explanation. The attempt has been made to show that altered nomenclature, or, again, that variation in degree of resistance in the population, may have played a part here; but a simple solution of the difficulty is forthcoming if it be assumed that migration has been operative.[2]

(3) While there has been improvement in the general death-rates at most age-periods, there has been a decided tendency for those at the later periods to show increase. The explanations which have been suggested do not, perhaps, cover the entire ground. The Registrar-General, in his Annual Report for 1909, attributed the higher rates at older ages to the lessening amount of over-statement of the ages of old people nowadays, as compared with years gone by. Sir Shirley Murphy has referred to this question (loc. cit.), and to variations in death-rates at the several age-periods generally. Such variations may, as Sir Shirley suggests, be due to altered environment. It is noteworthy, however, that "for adolescents and young adults up to the age of 25, the eighties were the period of greatest decline" (Registrar-General's Annual Report, 1909), and the writers of the Census Report refer to the "exceptional volume of emigration during the decennium" (1881-90). It appears, therefore, that emigration may have played some part in determining the alteration under consideration. As regards increase at later ages, there needs further to be borne in mind the question of the return of emigrants to their own country.

(4) A further point to be noted is the occurrence of low general death-rates and low phthisis death-rates in rapidly growing and prosperous towns. Correction for age-distribution does not wholly explain the phenomenon, and there can be no doubt that the quality of the migrating population plays an important part here. Possibly, however, the influence of changed environment under new conditions of life may also have to be taken into account.

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[1] *See* Tatham's table, p. xciv, Supplement to Sixty-Fifth Annual Report of Registrar-General (England and Wales) (1902), 1904.

[2] In Ireland, as already noted, the age- (and sex-) incidence of phthisis differs markedly from that of England and Wales. It tends to follow that of the Sussex villages in the fifties; thus there are the higher rates at the migrating ages and among women. The differing character of the emigration in England and Wales and in Ireland must have considerable influence in bringing about this varying incidence upon age and sex.

(5) Dr. Bulstrode, when he prepared the charts in his Sanatorium Report, left room for the death-rates of succeeding years to be filled in, and he was wont to say that, as time went on, the decline would give place to a more or less dead level, or even to a rise. Professor Pearson has recently insisted upon the fact that there is now observable a slackening in the rate of fall in the phthisis death-rate of this country. It has been suggested that this phenomenon can be reconciled with increasing use of sanatoria, if it be assumed that the growth of institutional treatment, in combination perhaps with other influences, is leading to lessening resort of patients to other lands in search of health.

On the whole, then, it must be concluded that but little is accurately known as to variations in the real death-rate from the disease now called phthisis in this country. Sydenham speaks in the letter to Cole of phthisis " killing two-thirds of those who die of chronic affections." Thomas Young says it is " so frequent as to carry off prematurely about one-fourth of the inhabitants of Europe." W. Heberden believed that the disease increased notably during the eighteenth century. Nowadays it is generally supposed to be declining. There is really, however, no evidence upon which to base a precise statement ; but while this is so, it by no means follows, as might perhaps be assumed, that the environmental improvements of the last fifty years have been without influence. Medical officers of health have always held that there are two chief ways in which phthisis death-rates are influenced by environment. Better food and better housing undoubtedly go with low phthisis-rates. On the other hand, the tendency of urbanization is to act in the opposite direction. It may be that loss and gain largely counterbalance one another, and that close correlation between certain environmental influences and phthisis death-rates will not, therefore, be found. Even if this be admitted, it by no means follows that heredity and direct case-to-case infection are the only things worth consideration. Professor Pearson, two years ago, was only prepared to say, " I will not dogmatically assert that environment matters not at all " ; but he has now come to recognize that considerable importance must be attached to it, indeed, " Environment " finds a place upon one of his latest title-pages. In view of this fact, and of his discovery of the existence of a Public Health " literature," further development of his views may be predicted in the near future.

Meanwhile, the main conclusion emerging as the result of all recent epidemiological work is that " the prevention of consumption involves something more than the mere circumvention of a bacillus." It is

interesting to recall Leichtenstern's comments, made in 1883: "For all Koch's brilliant discovery, there are still many lacunæ and open questions facing us in the ætiology of consumption; and these offer to the practitioner, to the statistician, to the pathologist who studies the history and geography, to the pathologist who experiments, and to the bacteriologist, a wide field wherein to co-operate. It is not by the power of any sudden enthusiasm treating the infective nature of phthisis as if it were already made perfectly clear, that the new doctrine will be made secure of its position, but by earnest work and prolonged study." Hirsch quotes this, and adds the remark, "I should even go further and maintain that these gaps in our knowledge are much greater than seems to be commonly supposed, and that, until they be filled up, we cannot promise to ourselves any answer to the question how important the tubercle bacillus may be for the origin of consumption."

Epidemiological Section.

November 22, 1912.

Dr. W. H. Hamer, President of the Section, in the Chair.

The Influence of Parental and Grandparental Age at Birth of Offspring on their Susceptibility to the Zymotic Diseases.

By R. J. Ewart, M.D.

Within the last few years much attention has been directed towards the second generation with a view to the discovery of laws which modify the type of offspring produced. Amongst other factors, age of parent at birth and birth sequence have received some attention, and several observers have dealt with this subject, amongst whom may be mentioned Henry Ancell and Matthews Duncan as far back as the seventies; of more recent observers are M. de Köröse, Directeur de Statistique, Budapest, who has shown that a pertinent relation exists between age of parent at birth of offspring and the subsequent type of the child; Mr. Havelock Ellis who, in his work on " British Genius " shows that those born about the twenty-fifth year and also late in life seem to be blessed in this way; and Dr. Marro, who at the International Congress on Eugenics last August demonstrated an even closer relation when dealing with intellect. Dr. Buchan and I have shown also that birth sequence and infantile. mortality are closely associated. M. Lucien March has corroborated this fact and has discussed the possibility of parental age at birth being the determining factor. Basing his arguments on the peculiarities of the first birth, he concludes that the increase of mortality is due to sequence, and not to the increased age of the parent. We can, however, question this deduction, though the reason why need not be set out here. The general conclusion that both birth sequence and age of parent at birth are factors in modifying both the type and subsequent development of the child seems to be highly probable.

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The influence of birth sequence I have dealt with previously,[1] and on the present occasion I intend to consider the transmissible effect of time only, that is, influence of age of parent at birth on offspring.   Perhaps it would be helpful to others if I mention the precautions that must be taken, if fallacy is to be avoided.

First.—The basis on which material is selected must be uniform, that is, offspring born in a particular year only should be considered.

Second.—The character under consideration must be compared with the parent when he or she was of the same age.   Thus, a child of 13 years, who is in Standard VII, is compared with that which the father and mother reached at a corresponding age.   In dealing with stature, &c., this cannot be done, and the present height of parent must be taken, though allowance should be made for any alteration in the physique that occurs after the fortieth year, otherwise the comparison will not be on a uniform basis.   Both parents should be seen, but often this is hardly possible.   Still, owing to the correlation between mates, significant results can be obtained if one only is considered, which is usually the mother.   The way in which the data are handled is of little moment in comparison with the method adopted in collecting them. Professor Pearson's correlation factors can be used, but I have contented myself with means and percentages which, though not measuring differences accurately, form a good indication of the direction of the bias.

Third.—At least two age-periods should be taken, so that some idea as to the effect of death amongst the parents may be formed.   Thus, mothers of children who are 14, and were born after the fortieth year, will be now over 55.   If, however, the child is now 5, the corresponding mother will be 46 ; and as more deaths will have occurred amongst the former than the latter, some estimate must be made as to the nature of the type that has disappeared.

Fourth.—As far as possible different races should not be included, unless proof is forthcoming that their reproductive habits are the same. In my own work in Middlesbrough I have dealt with an essentially mixed race, which has come from all quarters of the country.

Fifth.—Three generations should be considered, but, practically, except in rare instances, this is impossible, and we seldom find reliable records of grandparents amongst the class with which I have dealt. Still, where such can be obtained, they should be noted.

Sixth.—It is advisable in work of this kind that forms should not be used.   The observer should actually see his rough material, and all

[1] *Eugenics Review*, October, 1911.

questions relative to ages should be made directly. This criterion was strictly adhered to in the present work.

Lastly.—The number should be sufficiently large to ensure that the chance of a significant sequence is strongly in our favour.

That one birth of itself influences the next we can dismiss, though as regards sex there is some evidence that such a connexion exists. For example, M. March states that sequence—namely, girl following girl and boy following boy—is found to occur about fifty-four times out of a hundred couples, but if sex is to some extent dependent on age, as there seems reason to believe, this hypothesis may not be necessary to explain the fact; indeed, the suggestion would be that the present birth is not influenced by substances arising from the previous embryo, though I should admit that this is contrary to a view I formerly held. That interval is a factor in producing a modification of development is beyond question, and we know that the time necessary to recover completely from the effects of the birth varies according to the age of the mother. As the influence of birth sequence when analysed seems eventually to form a factor of age of parent, our problem is in either case to consider the influence of parental age on offspring, taking into consideration the length of time between the births. In dealing with the influence of age of grandparent through the parent on the offspring the problem becomes more simple, as these variations tend to approximate a constant mean, and under such conditions we find the character under consideration following a constant curve. It is impossible to examine fully the whole biological aspect of this question, and in the present instance only a few examples can be given, as our main object is to apply this law to epidemic diseases.

The only character apart from immunity that I will refer to here is stature, though it must be understood that it is taken as an example only from other investigations, which include eye colour, death, fertility, and ability. The first table, compiled from my observations at Middlesbrough, illustrates the influence of sequence.

TABLE I.—SEQUENCE OF BIRTH, STATURE, AND INTELLECTUAL STANDARD AT THE END OF SIXTH YEAR.

	Number	Mean height	Percentage able to read
First-born	225	41·4	33·0
Second	186	41·3	33·5
Third	140	40·7	34·0
Fourth	100	40·2	28·0
Fifth ...	89	39·9	25·0
Sixth and over	203	39·7	24·0

That the foregoing sequence is dependent on both interval and age is shown by the following :—

TABLE II.—INTERVAL AND SEQUENCE OF BIRTH, AND PHYSICAL DEVELOPMENT OF CHILD IN SIXTH YEAR.

| | | Age of parent at birth of child | | | |
| | | 20 to 30 | | 30 to 40 | |
	Interval	Number	Mean stature	Number	Mean stature
First, second, and third child	2 years	177	41·99	45	41·19
Fourth, fifth, and sixth child	1¾ ,,	78	39·94	49	40·84

However, if first births only are taken, the stature at the sixth year increases as the mother gets older, though, if the ratio between mother and child is considered, it seems to follow a curve coincident with age at birth—that is to say, this variation depends on type.

The following table gives the mean differences between height of mother and offspring according to age of parent at birth of child (born in 1901, measured in 1910).

TABLE III.

Age of mother at birth of child	Number	Mean difference between mother and child in tenth year		Correction necessary for age of mother		
20 and under	39	...	12·90 in.	...	—	...	12·90
21 to 25 ...	193	...	12·25 ,,	...	—	...	12·25
26 to 30 ...	246	...	12·18 ,,	...	—	...	12·18
31 to 35 ...	167	...	12·47 ,,	. .	0·15	...	12·62
36 to 40 ...	108	...	12·50 ,.	...	0·29	...	12·79
41 and over	34	...	11·95 ,,	...	1·09	...	13·04

If we now consider the age of the grandparent at birth of parent on the difference between mother and child of stated age (tenth year), we get the following :—

TABLE IV.

Age of grandmother at birth of mother			Number			Difference between mother and child in tenth year
20 and under	...	...	111	...	...	12·47
21 to 25 ...	...	...	190	...	...	12·20
26 to 30 ...	...	...	206	...	...	11·95
31 to 35 ...	...	...	150	...	...	12·12
36 to 40 ...	...	...	87	...	...	12·59
41 and over	...	...	48	...	...	13·08

Before we draw any inferences from these tables, it would be as well to examine closely exactly what has been done. In Table III the disturbing factors of heredity and type of mother have been to some extent removed by comparing offspring and parent, and as regards the characters under consideration, all are constant, with the corrections for

acquired variation, except age at birth amongst mothers, and stature amongst the offspring. Now in Table IV we have considered the grand-parental age at birth of parent on the difference between sire and offspring. It must be remembered, however, that the child is now apparently constant and the parent variable, and by a comparison, the variation arising from type is removed. Hence we would seem to be estimating the effect of age of grandparent at birth on characteristics of the sire, not the offspring. This is not absolutely true, as will be seen later in dealing with fertility. If we now compare the sequences, we find that the influence of age of grandparent at birth on parent corresponds to the influence of parent on offspring, so that we can not only assume that such a connexion exists, but that the character thus acquired is transmissible from one generation to the next.

If, on the other hand, we had selected only maturity births of maturity births, that is, offspring born between the twenty-fifth and thirtieth year of parents who were themselves produced at a corresponding age, we should find a rise in stature of approximately ¼ in. per generation. The reason why giants do not arise more frequently amongst us is easily explained, but to do so would lead me too far from the present theme. From these tables we can assume that time affects the offspring through the parent much in the same way as it does ourselves—that is, both directly and indirectly. By directly I mean that we grow old no matter what happens, and by indirectly that the influence may be accelerated by what is known as a bad environment. So it would seem that the ova themselves vary in type according to the age of mother, the best being produced at maturity, that is, about the twenty-seventh year, and their subsequent development may be modified by birth interval, which, as the parent gets older, should be longer, if the proper nutritive processes are to be brought into play. This may be described, biologically, as the influence of time prior to fertilization, and after or during the natal period. Perhaps the strongest piece of evidence in favour of this view is found in the way we select a mate, for it appears that through selective mating qualities dependent on age at birth are subconsciously recognized.

A little study of this table will show that selection appears to follow a law—namely, a man is selecting a woman born of parents of the same age or older than himself. If this factor were not recognized the sequences, reduced to a basis of 100 in the columns when read from left to right, should be approximately equal, which they are far from being. Should the male be born in the fortieth year of his parents, or over, he

is unlikely to find a mate corresponding in regard to parental age, so he selects from the opposite extreme. It may be noted in passing that by inquiry it was found that the grandparents were not known to each other previous to the introduction of husband and wife in 75 per cent. of the cases. Hence the influences of family friendships may be ignored. The inference is that since we subconsciously recognize age of parent at birth through the force of selective mating, peculiarities dependent on such must exist.

TABLE V.—HUMAN MATING (GOOD ARTISAN CLASS).

(Only those who reproduced in 1901 are considered.)

Age of grand-father at birth of wife	Age of grandfather at birth of husband									
	Under 25		21 to 30		26 to 35		31 to 40		36 and over	
	Number	Per 100	Number	Per 100	Number	Per 100	Number	Per 100	Number	Per 100
Under 25 ...	30	12	51	11	41	10	37	11	53	19
21 to 30 ...	57	24	103	23	92	22	70	21	67	20
26 to 35 ...	66	28	133	29	129	29	74	23	43	16
31 to 40 ...	50	21	98	22	97	23	73	22	50	19
and over	32	13	59	11	66	15	73	22	61	23
	235		444		425		327		274	

My conclusion is, that the type of offspring varies according to age of parent at birth, and that such is transmissible to the next generation, but beyond this there are also variations dependent on duration of birth interval and incomplete recovery arising from the exhausting influence of previous births, which, in so far as they are acquired in the sense that Weismann uses the word, are not transmissible. If this is true, as I believe it to be, it is a most far-reaching discovery, though in the present instance I only propose to deal with its bearing on immunity.

In dealing with the part of our subject that particularly interests this Section of the Society—namely, infectious disease—the assumption was made that the factor of hereditary immunity was small in comparison to the risks of infection, and data were collected on that basis. Unfortunately, such is not the case, and it would seem that even the susceptibility to scarlet fever can be regarded as of equal, if not greater, import than chance of infection. The following observation bears this

out : Taking the percentage of mothers who have had scarlet fever as 20, and the number of children between the ages of 6 and 13 as 12 per cent., the question arises, how often should we meet a mother and child, both of whom have had this complaint, at an interval of at least twenty years ? The answer may be stated as follows :—

TABLE VI.

Chance.

Mothers	Children					
	Had scarlet fever		Have not had scarlet fever		
Had scarlet fever ...	...	2·4	...	17·6	...	20
Have not had scarlet fever	...	9·6	...	70·4	...	80
		12		88		100

If we now select couples at random from the population, the following distribution is obtained in a group of 600, which, reduced to a basis of 100, reads as follows :—

Actual.

Mothers	Children			Transfer
	Had scarlet fever	Have not had scarlet fever		
Had scarlet fever ...	5·1	...	14·9 ... 20	+2·7	−3·3
Have not had scarlet fever	6·9	...	73·1 ... 80	−3·3	+2·7
	12		88 100	

Thus the actual number of mothers and children, both having had scarlet fever, was 5·1, the number expected being 2·7—about half as many. Hence a significant susceptibility to this complaint must exist if the facts here dealt with are representative. It is therefore advisable, in considering the influence of the age of parent at birth on immunity of offspring, that the two should be compared so as to remove the factor of heredity. Both parents should be considered, but, as has been already indicated, owing to the selective nature of mating, significant results can be obtained when one only is dealt with. In most of my data, however, bearing on immunity the type of parent from which the child sprang has not been considered, and we have seen, in dealing with other characters, that such corrections make our sequence more regular and the curves steeper, we may therefore assume that they probably indicate an actual bias. There are, moreover, many practical difficulties in obtaining trustworthy histories relative to such diseases as measles, whooping-cough, small-pox, &c., so that we are compelled to rely on the direct method of correlating the character with age of parent at birth, irrespective of type. Material can be selected in two ways : either by

direct inquiry of the parent, or through the returns made by general practitioners under the Notification of Infectious Diseases Act. The former was used in cases of the minor ailments and the latter with respect to diphtheria and scarlet and enteric fevers. As the first method simply concerns percentages, it needs no further explanation, but in the latter an attempt has been made actually to calculate attack-rates.

TABLE VII.—INCIDENCE OF MEASLES AND OTHER DISEASES ON CHILDREN IN THE FIRST SEVEN YEARS OF LIFE (BORN IN 1903), ACCORDING TO THE AGE OF THE MOTHER AT BIRTH (GOOD ARTISAN CLASS).

Age of mother at birth of child	Number of inquiries	Number of illnesses per child	Number attacked with measles per 100	Number attacked with whooping-cough per 100	Number attacked with chicken-pox per 100
20 and under ...	21	2·05	97	63	35
21 to 25 ...	143	2·25	89	59	45
26 to 30 ...	182	2·1	88	54	41
31 to 35 ...	92	2·1	82	48	38
36 to 40 ...	54	1·9	82	40	25
41 and over ...	41	1·7	80	43	44

The column " Illnesses per child " included pneumonia, vague febrile attacks, and other ill-defined conditions. To ensure the accuracy of the information, only a good citizen class was dealt with, and the inquiry was first made in 1909, when the children were over 6 years of age, and again in 1911, when they had reached the eighth year. Any discrepancy in the replies as regards age and sickness were inquired into, and if verification was not forthcoming they were ignored.

A procedure of this kind is necessary when information is procured second-hand. As to whether the children really had the ailments attributed to them is, of course, open to question; but such an error is again assumed to be equally distributed, and hence neutralizes itself in comparison with a similar series of data.

Further details were obtained with reference to the incidence of these diseases on first children and those born at under or over a two-yearly interval. The differences noted were small, and did not indicate any particular susceptibility of either class.

Before considering the major infectious ailments, some further explanation is necessary as to the nature of the material and the way it was handled. In the population (Middlesbrough) under consideration there were in the years 1905-10 a mean of 2,557 boys and girls living in any one year between the second and fifth; of these 638 were born between the twenty-first and twenty-fifth years of the mother.

Now in the seven years 1904-10 there were 548 cases of scarlet fever amongst the children of 2 to 5 years, and of these 166 were born between the twenty-first and twenty-fifth year of the mother, which gives an average incidence for one year of 23·86 cases. Since this figure includes ages from 2 to 5 years, the mean for one of these years is 5·9: therefore in this particular group 5·9 children were attacked out of a possible 638, giving a rate of 9·29 per 1,000. A good many cases of infectious disease escape detection; still, on the assumption that such an error is distributed fairly evenly over all the classes given, it should not vitiate the accuracy of the trend of the incidences. The results are easily followed in the following tables, and it is interesting to note that generally the same curves are observed as were found in reference to stature.

The incidence of scarlet fever practically follows the same law as given for the minor ailments. The conclusions to be drawn from the figures are curious, and somewhat contrary to what would have been expected. The infectious diseases appear to fall heaviest on those children born between the twenty-third and twenty-eighth year of the mother, and as regards the father the period seems to be about five years later. The latter figures are not given, as they simply reflect the mother's influence—if the table is moved on for the period given. The contention that this incidence may be due to the selective death-rate in the first and second year, which we know falls heavily on those born at the extremes of the reproductive life—that is, those who die at these times from other causes would ultimately be stricken with these complaints—can hardly be maintained, as we see that with scarlet fever the same incidence is observed in the one-year period, though hardly so pronounced. Still, the number of cases at this early age is small, and hence too much reliance must not be placed on them. It would seem that when growth is fastest the susceptibility to infectious disease is greatest, provided that immunity has not been acquired previous to that time.

In diphtheria, for the first year the curve is inverted, but as soon as independent life is established—that is, the end of the first year—it is the same as with scarlet fever, and again towards the end of the growing period the tendency to inversion appears. Enteric and other febrile disturbances agree in the main; and here a fifth period is added, that under one being left out. It shows in a very marked manner the tendency already mentioned for the period of greatest susceptibility to change from the middle to those born at the extremes of life, as soon as the rate

TABLE VIII.—SHOWING INCIDENCE OF SCARLET FEVER ACCORDING TO AGE OF MOTHER AT BIRTH OF CHILD (3,027 CASES BETWEEN YEARS 1904 AND 1910).

Age of mother at birth of child	Number of children 1 year old and under 2,939			Mean number living in the 2nd, 3rd, 4th or 5th years 2,557			Mean number living in the 6th, 7th, 8th, 9th or 10th years 2,311			Mean number living in the 11th, 12th, 13th, or 14th years 2,194		
	Number of boys and girls living	Mean number attacked in one year	Number attacked per 1,000	Number of boys and girls living	Mean number attacked in one year	Number attacked per 1,000	Number of boys and girls living	Mean number attacked in one year	Number attacked per 1,000	Number of boys and girls living	Mean number attacked in one year	Number attacked per 1,000
20 and under	220	0·14	0·64	181	0·55	3·04	150	1·43	9·53	123	0·86	5·5
21 to 25 ...	764	0·57	0·74	638	5·9	9·25	566	7·86	13·88	566	2·54	4·48
26 to 30 ...	870	1·00	1·15	789	6·54	8·29	730	7·93	10·86	671	2·58	3·84
31 to 35 ...	635	0·43	0·68	573	3·28	5·72	511	4·23	8·28	478	2·46	5·17
36 to 40 ...	332	0·28	0·84	271	2·00	7·38	261	2·03	7·77	286	0·72	2·52
Over 40 ...	117	0·14	1·1	105	0·54	5·14	93	1·00	10·75	70	0·35	5·00

DIPHTHERIA.   ANALYSIS OF 660 CASES.   DETAILS SAME AS ABOVE (1904-1910).

Age of mother at birth of child	One year and under		2nd, 3rd, 4th or 5th years		6th, 7th, 8th, 9th, or 10th years		11th, 12th, 13th, or 14th years	
	Mean number attacked in one year	Number attacked per 1,000	Mean number attacked in one year	Number attacked per 1,000	Mean number attacked in one year	Number attacked per 1,000	Mean number attacked in one year	Number attacked per 1,000
20 and under ...	0·29	1·32	0·64	3·54	0·34	2·27	0·18	1·46
21 to 25	0·43	0·56	2·75	4·31	2·43	4·29	0·57	1·01
26 to 30	0·57	0·65	3·39	4·30	2·57	3·52	0·97	1·45
31 to 35	0·43	0·67	2·04	3·56	1·66	3·25	0·57	1·19
36 to 40	0·14	0·42	1·14	4·21	0·80	3·06	0·36	1·26
41 and over ...	0·14	1·20	0·39	3·71	0·28	3·01	0·11	1·57

ENTERIC AND OTHER FEVERS.   ANALYSIS OF 230 CASES, YEARS 1904-1910.   DETAILS AS ABOVE.

Age of mother at birth of child	2nd, 3rd, 4th or 5th years		6th, 7th, 8th, 9th or 10th years		11th, 12th, 13th or 14th years		15th, 16th, 17th, 18th, 19th or 20th years	
	Mean number attacked in one year	Number attacked per 1,000	Mean number attacked in one year	Number attacked per 1,000	Mean number attacked in one year	Number attacked per 1,000	Mean number attacked in one year	Number attacked per 1,000
20 and under ...	0·03	0·17	0·14	0·77	0·11	0·73	0·48	3·90
21 to 25	0·32	0·42	0·74	1·16	0·46	0·81	0·54	0·95
26 to 30	0·68	0·78	0·77	0·98	0·46	0·63	0·40	0·60
31 to 35	0·11	0·17	0·29	0·50	0·27	0·53	0·40	0·84
36 to 40	0·14	0·42	0·14	0·52	0·07	1·27	0·26	0·91
41 and over ...	0·11	0·94	0·11	1·05	0·14	1·51	0·26	3·71

of growth has ceased. The following table relative to the incidence of
death from diphtheria is of interest in so far as it suggests that attack-
rates and the mortality coincide.

TABLE VII.—AGES 2 TO 10. 1904-1910. MIDDLESBROUGH.

Age of mother at birth of child		Number attacked			Number of deaths			Rate per 1,000 attacked
20 and under	...	17	...	...	2	...	...	118
21 to 25	...	104	...	...	22	...	...	211
26 to 30	...	121	...	...	26	...	...	205
31 to 35	...	84	...	...	16	...	...	181
36 to 40	...	39	...	...	10	...	...	271
Over 40	...	11	...	..	2	...	...	191
		376			78			

If we consider the type of parent from which the child came, the
corrected incidences for scarlet fever are :—

TABLE VIII.

Age of mother at birth of child		Number of children attacked			Number of mothers who had also been attacked when young			Number per 1,000 in which child only has been attacked
20 and under	...	10	...	...	6	...	...	40
21 to 25	...	68	...	...	16	...	...	77
26 to 30	...	70	...	...	18	...	...	75
31 to 35	...	40	...	...	14	...	...	65
36 to 40	...	30	...	...	14	...	...	52
41 and over	...	8	...	...	4	...	...	50

The numbers are few, but they show what has already been stated,
namely, that the age influence is more easily studied when the heredi-
tary factor is partially or completely removed.

The following tables deal with grandparental age :—

TABLE IX.—SCARLET FEVER AND GRANDPARENTAL AGE.

Age of grandmother at birth of mother		Number of children attacked with scarlet fever			Number where mother also had been attacked when young			Percentage of children only attacked per 100 cases
20 and under	...	15	...	...	5	...	...	50 { 66
21 to 25	...	66	...	...	15	...	...	{ 47
26 to 30	...	68	...	...	17	...	...	75
31 to 35	...	40	...	...	14	...	...	65
36 to 40	...	32	...	...	13	...	...	62 { 55
41 and over	...	16	...	...	5	...	...	{ 69

The sequences in the percentages show that the susceptibility of
the mother depends on the age of the grandmother at her birth, and
also that the same curves are observed when the third generation is

considered, thus giving a further suggestion that the immunity or susceptibility depending on age at birth is a transmissible character.

We may now pass to consider the influence of grandparental age on the susceptibility to the minor ailments, no allowance being practical for peculiarities dependent on type or hereditary characteristics.

TABLE X.

Age of grandfather at birth of father				Number of inquiries				Number of minor ailments per child in first ten years
20 and under	...	...	...	11	...	...	...	2·36
21 to 25	...	...	...	47	...	...	...	2·34
26 to 30	...	...	...	73	...	...	...	2·35
31 to 35	...	...	...	50	...	...	...	2·26
36 to 40	...	...	...	45	...	...	...	2·02
41 and over	...	...	...	29	...	...	...	2·28

Age of grandmother at birth of mother				Number of inquiries				Number of minor ailments per child in first ten years
20 and under	...	...	...	23	...	...	...	2·78
21 to 25	...	...	...	59	...	...	...	2·5
26 to 30	...	...	...	62	...	...	...	2·45
31 to 35	...	...	...	58	...	...	...	2·33
36 to 40	...	...	...	35	...	...	...	2·2
41 and over	...	...	...	22	...	...	...	2·5

One point which is not directly connected with our subject deserves some attention, as it has a bearing on the argument—namely, size of family, as influenced by age of grandparent at birth of parent.

TABLE XI.

Age of grandfather at birth of father			Mean size of family born					
			Good artisan		Mixed			Slum
20 and under	...	...	5·2	...	6·2	...		6·9
21 to 25	..	...	...	4·4	...	5·9	...	5·6
26 to 30	...	...	...	3·8	...	5·4	...	6·2
31 to 35	...	...	...	3·9	...	5·5	...	6·6
36 to 40	...	...	...	4·0	...	5·7	...	7·0
41 and over	...	...	4·6	...	5·0	...		7·3

Number of families investigated, 612.

Two diseases necessitate special consideration—namely, small-pox and tuberculosis.   The majority of the data obtained were abstracted in the case of small-pox from the records in London and Leicester, which were placed at my disposal, and in the case of tuberculosis from the Meathop Sanatorium.   Perhaps it might be of use if I take 410 cases, as given in the *Sanitary Record*.[1]   They read as follows :—

[1] Pearson, *San. Rec.*, September, 1912.

<div align="center">TABLE XII.</div>

Mother's age at birth of unit	Phthisical population per 1,000						Per 1,000 general population (adult)
	Crude			Corrected			
20 and under ...	56	...	...	55	...	...	51
21 to 25 ...	224	...	...	222	...	...	256
26 to 30 ...	308	...	...	300	...	...	312
31 to 35 ...	211	...	...	213	...	...	220
36 to 40 ...	158	...	...	160	...	...	131
41 and over ...	43	...	...	50	...	...	30

The corrected column is added, and is an attempt to account for an error which Professor Pearson overlooked—namely, that consumptives come of a stock which has a life expectancy below the average, hence the births that should occur in later years are missed. It is hardly necessary, perhaps, to exemplify this point, as a history of tuberculosis considerably lowers the value of a life for insurance purposes. Elaborate tables will be found bearing on the age-incidences of general death and that arising from phthisis in the Registrar-General's Returns. We must also remember that the death of one mate in most cases prevents further reproduction in the other, so the effect is greater than at first appears. In the corrections appended to Professor Pearson's figures I have assumed that close on half of the persons at present affected with this complaint come of a phthisical stock. It is, however, advisable that all these disturbing factors should be avoided by altering the basis of selection so as to produce uniformity in the first instance. It makes the collection of data more difficult, no doubt, but less juggling with the ultimate results is necessary. In a series of 179 cases where as far as possible biological homogeneiety was aimed at with reference to mean age, sex distribution, social grade, &c., the following sequences were obtained. (Tuberculosis occurring in units previous to the fifteenth year is excluded.)

<div align="center">TABLE XIII.</div>

Age of mother at birth	Phthisical population per 100			Normal population per 100			Difference
20 and under ..	8	...	...	6	...	...	+ 2
21 to 25 ...	22	...	...	26	...	...	− 4
26 to 30 ...	22	...	...	30	...	...	− 8
31 to 35 ...	26	...	...	22	...	...	+ 4
36 to 40 ...	14	...	...	13	...	...	+ 1
41 and over ...	8	...	...	3	...	...	+ 5

The numbers are small, but, along with Professor Pearson's corrected figures, I think the evidence is sufficient to suggest that this complaint

is met with rather more frequently at the beginning, and with increasing incidence on those born at the end of reproductive life. It is to be borne in mind that phthisis claims its victims in adult life, mean age being about 28 years.

Now, when we turn to small-pox, we find a different state of affairs. In close on 400 cases of small-pox, the mean age of the patients being 11 years, the following distribution for age at birth was found :—

<div align="center">TABLE XIV.</div>

Age of mother at birth of the unit	Small-pox population per 100			Normal population of corresponding mean age per 100			Difference
20 and under	4	...	...	8	...	...	− 4
21 to 25	26	...	...	25	...	...	+ 1
26 to 30	32	...	...	30	...	...	+ 2
31 to 35	25	...	...	22	...	...	+ 3
36 to 40	11	...	...	11	..	...	− C
41 and over	2	...	..	4	...	...	− 2

<div align="center">TABLE XV.</div>

Age of father at birth of unit	Small-pox population per 100			Normal population of corresponding mean age per 100			Difference
20 and under	2	...	...	3	...	...	− 1
21 to 25	21	...	...	19	...	...	+ 2
26 to 30	30	...	...	27	...	...	+ 3
31 to 35	28	...	...	24	...	...	+ 4
36 to 40	12	...	...	15	...	...	− 3
41 and over	7	...	...	12	...	...	− 5

Comparing a small-pox population and a phthisical one through the medium of corresponding population of similar mean age, we get :—

<div align="center">TABLE XVI.</div>

Age of mother at birth of offspring	Difference for phthisical population			Difference for small-pox population			Gross difference in favour of small-pox
20 and under	+ 2	...	...	− 4	...	...	− 6
21 to 25	− 4	...	...	+ 1	...	...	+ 5
26 to 30	− 8	...	...	+ 2	...	...	+ 10
31 to 35	+ 4	...	...	+ 3	...	...	− 1
36 to 40	+ 1	...	..	− 0	...	...	− 1
41 and over	+ 5	...	...	− 2	...	...	− 7

That is to say, out of 100 units born, seventy might be attacked with both diseases, fifteen by small-pox only, fifteen by tubercle only. A certain number would, of course, escape both.

This method of demonstrating that the types of people attacked by these two diseases are different must, at the best, be approximate only,

for if this influence of time plays such an important part in our life, it is obvious that age at birth is only a rough way of estimating it, as we know that many who are 35 years old correspond to others who have only lived for 25 years or even less. As has been shown, this influence is transmitted in varying degree, according to the generation dealt with, so that to get an accurate idea of how a particular unit stands with reference to what I term " the force of duration " we must not only consider age of parents at birth of unit, but each grandparent, and so on. I hardly think that there is any factor peculiar to the parasite which accounts for the way in which these diseases distribute themselves, and I am inclined to the view that the incidences would be identical were the mean age of attack similar, and no difference would be found if the mean age of death from tuberculosis were between the second and twelfth years. " We might postulate this as a rule, that the kind of person killed by a specific disease varies according to its age-incidence." It is hardly necessary for me to suggest what must happen to a population if all those units which should be killed by small-pox are allowed to live and reproduce, or to suggest that the whole of the decline of the death-rate from phthisis is due to this cause. It is worthy of note that the fall seems to have been dependent on something that happened about the beginning of last century before any alteration occurred in the sanitary administration of the country. And, further, the nature of the curve and its duration seem to lend support to this idea, for we see that it seems to follow fairly closely the thoroughness of vaccination, if an interval of twenty-five years is allowed to elapse—that is, sufficient time for the unit that has been saved to reach the middle of reproductive life. Corroborative evidence seems to be forthcoming from the decline of the birth-rate, for it has been shown that the maturity birth has a small family.

I sincerely hope, even though these findings rather tell against the possibility of the scheme at present being introduced into this country, that further investigations, on account of their biological interest, will be undertaken by the central authorities, for they alone are able to do such a work on a sufficiently large scale. France has already dipped into the subject, so surely we will not be left behind.

DISCUSSION.

Mr. Major Greenwood said he rose with some embarrassment because he was sure the Section had been much impressed by the enthusiasm which had inspired Dr. Ewart's paper, and the immense amount of labour which must have been devoted to the compilation of the statistics, and such criticism as he could offer might appear ungracious.　He, personally, had found it rather difficult to follow the author on to those higher planes which were, perhaps, more familiar to members of the Aristotelian Society than to this Section, but before the meeting could discuss the ultimate causation of any facts it would be well to be certain that they were facts.　Dr. Ewart remarked that the way in which the data were treated was of little moment in comparison with the method of collecting them.　If the meaning of that were that it was futile to spend much time over the analysis of data which were fundamentally vicious, everyone would agree with him.　But if Dr. Ewart meant that the methods of treatment, given the data were good, was a matter of pure indifference, one could only regret that Laplace and other great analysts had wasted so much time in evolving methods for the treatment of statistical data.　One could get material in which the differences were so immense relatively to the magnitude of the characters compared, that one did not need any elaborate investigation before reaching a conclusion.　If one took 300 or 400 people all aged 30, and compared the mean stature of that sample with the mean stature of 300 or 400 children aged 6, the differences between the means and the ratio of such difference to the absolute sizes was so large that it would be absurd to talk much about the effects of errors of random sampling.　But if one took 300 persons aged 25, and 300 others at $24\frac{1}{2}$, then the question whether the difference observed was significant could not be answered on inspection. All the tables in the present paper corresponded more nearly to the second of these cases.　Table I, he concluded, was intended to show there was a difference between the mean height of the first-born and the mean height of the second-born, third-born, &c.　On the face of the figures the differences were not very large ;　and as to whether they were or were not simply the effect of random sampling—i.e., whether, supposing the mean stature was the same in all such groups, one might not observe differences of these orders simply as the result of operations of chance—could only be determined by an investigation based on a knowledge of the variability of stature.　But that investigation had not been made, and no materials supplied in the paper allowed such test to be used.　But, taking the last column of the same table, that relating to the percentage able to read—a character which, for the immediate purpose, could be taken as either present or absent—one could roughly test the figures and see whether, given the number of cases there provided, the variations over the series were significant.　For instance, the worst deviation would be in the last group ; and so far as he could judge by rough analysis, it would arise as an error of sampling once in thirteen or fourteen times, whereas it had here occurred once

in six times. In other words, there was a deviation from the expected result, but no cautious person would base an argument on such a difference.

Passing to the tables of infectious diseases, which more especially affected this Section, the question was whether in Table VIII the deviations, which were very irregular, were or were not effects of random sampling. Such a question required delicate inquiry, because even if one might say that the chance of a person getting scarlet fever at a certain age was fairly well measured by the number of cases which occurred at that age divided by the number of persons at risk, the fluctuations about that mean value would not be given by the ordinary standard deviation of random sampling, because the events were not independent. In the case of tossing coins, one toss did not influence the result of the other tosses. But scarlet fever was an infectious disease, and the occurrence of one case of it affected the likelihood of other cases occurring; so that the fluctuations about the expected value would be very much more considerable than they would be about the mean in the case of the percentage able to read. No trace of such an investigation was presented in this paper. On turning to the table on which Dr. Ewart laid special stress, that relating to mating, the method revealed was even less adequate. In order to prove the point sought to be made there, a simple investigation was sufficient. Supposing 1 per cent. of grandparents (or parents) of all marriageable men were between 21 and 30 at the time of the birth of their children, and 2 per cent. of the grandparents (or parents) of all marriageable women were between those ages, then if the age of the husband's parent were independent of the age of the wife's parent, the chance of the concurrence of the husband having a parent of that age with a wife having a parent of that age would be $\frac{1}{100} \times \frac{2}{100}$. And if one had N couples, the number of such concurrences would be $N \times \frac{1}{100} \times \frac{2}{100}$. Then the expected number of cases on this chance hypothesis could be compared with the actual number, and the general nature of the agreement determined by considering the value of all the differences, taking every possible concurrence, or some function of such value. But the table in the paper was not prepared in a way permitting the application of that test, because the different classes overlapped. The first vertical section comprised parents between 21 and 25, and the limits of the next were 21 to 30; so some of the cases in the first column were also included in the second, and the conclusion drawn from a comparison of the percentages read from left to right might be misleading. No conclusion ought to be drawn from such a table, the entries in which were not independent. The foregoing were criticisms of method, but, even assuming that all the differences noted were significant in the sense of not being attributable to the ordinary effects of random sampling, did the conclusions which members were invited to draw follow from them? In the first table he understood that the mean height at a certain age of the first-born children was based on a sample of 225, which had been measured. Obviously they had not got here a case in which there were 225 families each of which contained six children, so that the author could compare the stature of the first-borns with the sixth-borns from the same

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families, because the numbers in the first column were not all the same; therefore, presumably, they were drawn to some extent from different families. He invited the meeting to note the possibly enormous significance of that. It was well known that fertility varied with social status: the average middle-class family was smaller than the working-class family, and the tendency was for the family to diminish in size as one passed up the social ladder. The result must be that as one passed from the " population " of first-borns to the " population " of sixth-borns one found a smaller and smaller percentage of the offspring of economically superior families. Consequently, if there was any tendency for the average stature of people in different strata to vary, the observed variations here might, for all that could be said to the contrary, be due to that. In Germany there was, he believed, evidence that the mean stature of the *Einjährige* in the army was greater than the mean stature of ordinary recruits at the same age; and he thought there was also evidence that the mean stature of the children in better-class schools was greater than the mean stature of children (at the same ages) in schools of poor neighbourhoods. Therefore it was difficult to see how evidence could be provided that in any given sample there was not, on the average, a difference of class between first and later born children.

To sum up he might say that: (1) No explanation was provided by Dr. Ewart to answer the preliminary question whether, assuming the data to be homogeneous, these differences were more than the effects of chance. And (2) even if the results were valid from that point of view, it seemed clear that the data were ambiguous, and the conclusion which could be drawn from them could not, in any scientific sense, be called a law.   No doubt these criticisms might be met, but if statistics were to be regarded as a science at all, it was incumbent upon any worker who presented a statistical paper either to adopt approved methods of testing his figures—such as were to be found in all elementary text-books—or to give in the paper some adequate explanation as to why they need not be applied.

Dr. SHRUBSALL asked whether, in studying eye colours, the author took only children of parents whose eye colours were known. Blue-eyed children were not likely to arise from the brown-eyed parents. With regard to the table of personal age and eye colour, he asked whether that was based on a study of the age changes of individual cases, or whether it simply represented the proportions of eye colours of children in Middlesbrough schools or Middlesbrough families at any given date. He also asked what means of measuring differences of eye colour were adopted, as it was a simple matter to make such measurements by means of the tintometer, and scarcely occupied longer than merely looking at the eyes.

Dr. EWART, in reply, admitted that he had not worked out the probable error in his cases, though this ought to be done. Unfortunately, mathematics was not yet a part of the medical curriculum. His method had been to collect a series of data, a number approaching a thousand. He worked out his results,

put the matter on one side, then repeated the process again on a second series of observations. If the results of the two tallied, he deemed them worthy of consideration. The mating tables he regarded as significant. He had compiled the figures of 2,000 matings, and so far as he could judge, the conclusions he had based on them were true. He had also taken a number of cases where the law had and had not been obeyed. There were 15 per cent. in favour of the bias he had given, and he regarded the numbers as outside the range of random sampling. The eye colour statements were simply colour differences; he had abandoned the idea of saying what absolute colour an eye was, there were so many shades. In his series he called them either the *same, plus*, or *minus*, according to the position of the colours in the spectrum, any change towards the red end being plus and the blue end minus when compared with the parent.

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Some Recent Theories of Tuberculosis and their possible Significance.

By F. G. CROOKSHANK, M.D.

IF I say that in this paper, which has been somewhat hurriedly written, at the courteous demand of your Secretaries, there is little of my own, save the thread which strings together the pearls or beads of others, I hope it will not be thought that I am anxious to evade criticism. Yet there is one criticism that I fain would forestall —that these notions are " purely speculative." Such criticism, although apparently conclusive to some, is generally irrelevant, and often, as when we are concerned, not with rash hypothesis, but with interpretation of observed facts, quite inaccurate. And there is no supposition, to my mind, more extravagant than that which suggests that we are in possession of all the facts bearing on the problems of tuberculosis, and that our official doctrines are in all respects adequate as explanations of those facts which we possess. Moreover, it is well to remember that, as Darwin said, without hypothesis there is no useful observation. Unfortunately, of late a vicious habit has prevailed. Clinical and statistical observations that are not easily reconciled with fashionable teachings are allowed to recede into the shade ; and those who would drag them from their limbo are, not uncommonly, hailed as fanciful or romantic. We should avoid the habit of deprecating hypotheses, or interpretations of facts, that are awkward to those with settled convictions or who have formulated plans of action on imperfect information. You, Sir, have shown us a more excellent way : and perhaps I am not wrong in suspecting that almost the chief lesson you desired to convey to us in your recent and illuminating address is that, whilst clinical and pathological observations are only partially elucidated, there is danger lest procedures which may appear to be justifiable or even necessary in the interests of the State, prove to be Dead Sea apples : dust and ashes in the mouth, and not the succulent and sapid drupes that we have fondly hoped. At any rate, you have reminded us that the prevention of consumption involves something more than the circumvention of a bacillus : and may I recall your citation, from Leichtenstern and Hirsch, to the effect that there are still many lacunæ in our knowledge of consumption?

Certainly, I suppose no one will deny that, until our knowledge is complete, attempts on the part of the State to grapple with the disease must be either empirical or unsuccessful. Possibly empirical action is sometimes more beneficent than that which is founded on incomplete knowledge or interpretation. Where are now the anti-spitting enthusiasts of ten years ago, who vowed they would abolish the "great white plague" by by-laws and municipal spittoons?

But while we in this country, putting the whole of the observations of our predecessors as to scrofula behind us, have been busy with public discussions directed towards one end, the abolition of phthisis, abroad much work has been done which cannot fail, I think, in time to widen enormously our conception of what tuberculosis really is, and what relation it bears to phthisis. The work of Poncet, of Lyons, ably seconded as it has been by his devoted coadjutor Leriche, and a band of enthusiastic disciples, has attracted little attention in Great Britain. In America it has excited ingravescent interest; and, on the Continent, many who scoffed at first now remain, if not to pray, at any rate to declare that they "knew it all along" to be correct. This work of Poncet's, though in aim clinical, has the deepest interest for the epidemiologist; for if rightly understood, it balances and completes that of von Behring, of Calmette, and of many others. I will ask you, therefore, to bear with me patiently if, in order to put Poncet's views, as I understand them, fairly before you it is necessary to revert for a few moments to what may seem very elementary matters.

In one of our leading text-books tuberculosis is defined as the formation, in one or more organs, of certain bodies, called tubercles, that are the result of infection with a specific organism—the *Bacillus tuberculosis.* In another text-book, of equal reputation, tuberculosis is defined simply as an infectious disease produced by the *Bacillus tuberculosis.* Now, since the bacillus received its name because it was shown to be the microbial agent in the production of tubercles, the former definition is, in strictness, the more correct. But, may the tubercle bacillus be the cause, or one of the causes, of lesions and processes that are not characterized by the presence of tubercles? If so, and if these lesions and processes are to be reckoned a part of tuberculosis, the second definition is in greater accordance with the observed facts. Yet, for an Englishman to apply the term "tuberculosis" to lesions and processes in which there are no tubercles is illogical. The French, however, may do so; for to them tuberculosis

is a process due to Koch's bacillus, and they speak not of tubercles but of follicles. So that by the happy term of "tuberculose non-folliculaire" they can indicate a process due to Koch's bacillus and yet without the anatomical signature of tubercles. For the sake of clearness then, may I adopt the wider definition, and the convention of speaking of lesions, in which there are no tubercles but are yet due to Koch's bacillus, as tubercular; and of alluding to those lesions, in which there are tubercles, as tuberculous?

If we now suppose syphilis to be only known to us primarily as a process of "gummatosis," a disease characterized by the presence of gummata; with the advance of pathological information we should have to take into consideration the early syphilides, which we would soon see have a fairly obvious clinical or historical relation to gummata. We should also have to consider the relation between the gummatous affection and those manifestations that we now call para-syphilitic. Doubters would say, that so far from these "parasyphilitic" processes being most obvious in those who show marked signs of gum-matosis, the contrary is indeed the case; and clinical instances would be triumphantly adduced of persons with "parasyphilitic" affections in whom, on examination, no evidence or history of any gummy process could be obtained. Now Poncet and his followers, in respect of tuber-culosis, hold views which may be said to correspond roughly with those we all hold in respect of syphilis—that is to say, that there are lesions and processes from which the anatomical signature of the specific granuloma is lacking, and of which some are "banal" inflammatory reactions, due to the operation, probably, of attenuated poison. The cautious views of those who go so far with Poncet as to recognize what they call "tuberculose non-folliculaire"—that is to say, lesions in which the tubercle bacillus but not tubercles may be found—are on a parity with those people who admit the clinical and pathological relationship between the secondary syphilides and gummata, but who may deny the syphilitic nature of what we call parasyphilides. For the lesions of what Poncet and Leriche call "tuberculose inflammatoire" are lesions in which there is neither tubercle nor bacillus, and which yet are believed to be due to the operation of an attenuated poison.

It would not be necessary to say that this analogy between syphilis and tuberculosis, or rather between some of the views held in respect of these diseases, is put forward purely as illustrative, if Hamburger had not, in the *Zeitschrift für Schulgesundheitspflege* (1912, No. 2) pushed

the analogy a little far. I use it entirely "without prejudice," as lawyers say.

Now for many years the dermatologists have been accustomed to point out that, though tubercle bacilli may be found in the tissues affected by lupus vulgaris, in lupus erythematosus it is not so, notwithstanding that it is in the latter rather than in the former affection that clinical investigation reveals a history of familial or of personal infection. Yet their observations have been unheeded by all save a few physicians. It now seems passing strange that, when we first became impressed by the notion that tuberculosis is a frequent, nay a usual, infection of urban children, and that those phthisical in later life represent only a fraction of those who become tuberculous when young, we did not inquire if it were likely that bacilli should remain "latent," and yet not give rise to clinical manifestations, by virtue of their toxins, in distant parts of the body.

The fact is, we were under the thrall of Virchow : humoralism had gone out with the Franco-German War, and no one dared suggest the "tubercular" nature of any process in which there were no tubercles, and perhaps no tubercle bacilli. Certainly, after a time the tubercular nature of many pleurisies was acknowledged ; but there was much skating over very thin ice, and to-day there are many British physicians who will not go very far, even in company with Landouzy. The dermatologists, and some oculists, however, refused to surrender their positions ; and Sir Dyce Duckworth alone amongst physicians dared to say a word in favour of scrofula, or the tubercular diathesis. So while the dermatologists and oculists maintained the "tubercular," or, if you will, the diathetic nature of certain disorders, on grounds which are at least as strong as those on which tabes is now recognized as syphilitic, the physicians remained under the spell of the unitarian conception of tuberculosis. It is true that, here and there, some light broke through the obscurities : Landouzy, Hutinel, Schmaus, Pitres and Vaillard did good work, but, as Poncet puts it, there was one formula, exacting and exclusive, " Toute tuberculose est folliculaire et tout follicule est tuberculeux." The doctrine of specific forms reigned unchallenged. " Every notion or observation was ignored that did not tally with the formula of the day."

The first great advance towards the recognition of the fact that the non-specific lesions and processes occurring during the course of tuberculosis—the simple serous effusions, the simple inflammations of the various mucous membranes, and so forth—are indeed tubercular,

and not merely intercurrent affections, was made fifteen years ago when Poncet demonstrated on clinical grounds the tubercular nature of many cases of arthritis. He showed that, quite apart from the destructive, caseating, tuberculous joint affections, in which both tubercles and bacilli may be found, there are also dry, plastic, ankylosing, or "serous rheumatisms" that may not be bacillary, that are probably toxic, but that indubitably occur in those the subjects of attenuated infection by the tubercle bacillus. He supported his contention by reasoning as convincing as that employed by dermatologists to prove the tubercular nature not only of lupus erythematosus, but of many cases of erythema nodosum.[1]

We now recognize, then, a tubercular "rheumatism" which may precede, or be coincident with, or may even be independent of, the classical, bacillary "tuberculous" arthritis of the surgical wards. It was the study of this tubercular "rheumatism" which led Poncet and Leriche to examine what they called "ab-articular tubercular rheumatism," and then to merge their ideas in the great conception of the tubercular inflammations: of "inflammatory tuberculosis." This, though first put forward in 1902, has only been formally defined in their volume published this year. Now, tubercular inflammation (or inflammatory tuberculosis) is that form or manifestation of tuberculosis in which the attenuated poison produces, in the tissues and organs, only ordinary inflammatory reactions. It is, then, non-specific in the sense of being without "signature"; there are no tubercles and no giant cells. Nor do we know tubercle bacilli to be present in the lesions themselves any more than, so far as we know, spirochætes are to be found in the posterior columns of a tabetic cord. But, under the most varied clinical disguises, and in the most unexpected manner, "inflammatory tuberculosis" may attack every tissue and every organ. There are many clearly defined types of disease, especially the chronic "cirrhoses," such as chronic indurative mediastinitis, whose ultimate pathology remains in suspense. Poncet claims to hold the key; for he says, very often it can be shown that the chronic process has shown itself, either in connexion with an early tuberculous infection, or in succession to one; and the clinical coincidence of these "banal" processes with known tuberculous infection is held to be so frequent that even the positive result of diagnostic tests, and the beneficent effect of specific treatment, are not necessary as justifications for belief in the existence of a causative correlation.

[1] Allbutt and Rolleston's "System of Medicine," 1911, ix, p. 467.

This is not to say that always is every commonplace inflammation or fibrous induration due to the effects of the attenuated poison of the tubercle bacillus, snugly ensconced in some out of the way mesenteric or bronchial gland. Very often a duplex causation is at work. Thus is the mystery of the pneumonokonioses revealed to us as by a flash. It is at least probable that we are now within measurable distance of understanding the confused pathology of hepatic cirrhosis. There is not time to dwell on the clinical puzzles that seem about to be solved; yet there are forms not only of eye and skin disease but of endocarditis, of neuritis, of serous effusion, and of plastic inflammation, that will occur to everyone as hitherto unexplained; and, most important, there is to be borne in mind the influence of the attenuated poison of the bacilli upon the whole series of ductless glands that determine the growth and development of the child. Possibly here is the explanation of the occurrence of the types of scrofula which, after all, represent morphological varieties of the species as plainly as do the cretins, the mongoloids, and some subjects of dyspituitarism.

The truth is that, as Poncet says, there is in tuberculosis a scale of virulence and a scale of specificity. Lessened virulence implies lesions without specific characters; and the indifferent reaction of the tissues to minimal dosage may be traced in every organ of the body. If miliary tuberculosis be due to intense and unresisted infection, we have, with lesser virulence and greater resistance, the ordinary "medical" cases of tuberculosis. Lower in the scale are those we call surgical: still greater attenuation and more active resistance gives us the minor surgical cases, and scrofula. Below these, again, in the scale of degradation come the bastard dermatological tuberculides, and, at the bottom, the tubercular inflammations, without any specific lesions, and a feeble and furtive existence of the bacillus here or there. Poncet's "septicæmic tuberculosis" and Landouzy's "typho-bacillosis" are at the other end of the scale, albeit not necessarily fatal.

I do not know that Poncet himself has hinted it, but it seems quite likely that if Much's work on the tubercle bacillus is to be recognized, as from a recent paper in *La Riforma Medica*[1] seems now must be the case, we shall soon be enabled to prove the tubercular nature of many of these "non-specific" inflammations by demonstration of Much's granular bodies in the tissues. The point must be borne in mind, for doubtless there are lacunæ in Poncet's pathology, though the force of his clinical

[1] Costantini, G., "Il valore del metodo di Much per la coloragione dei bacilli tubercolari," *Riforma Medica*, Napoli, 1912, xxviii, pp. 1121-28.

insight strikes one afresh every day.   It was not, however, till I had read
Poncet's book that I appreciated fully a brief paper, by McConkey, that
appeared in the *Medical Record* of New York on October 28, 1911.   Now
McConkey, in discussing the question, " Why is the apex the point of
election in pulmonary tuberculosis ? " asks why, since tuberculosis of the
lymphatic system is so common in childhood, is apical phthisis so usually
deferred till after puberty ? (The phthisis of childhood, wherein the lung
is invaded by direct extension from caseous bronchial glands is, for the
moment, irrelevant.)   He finds his answer in the laws of parasitism,
and defines tuberculosis as a parasitic disease, affecting the lymphatic
and serous systems of children.   He suggests that normal lung infection
is deferred until after puberty, for not till then does the host become an
actual or potential parent, and it is to the interest of the parasite to
leave the body of its host in such a manner that, in the way of domestic
intimacies, its species may be continued by entry into the body of
another host—a child.   Incidentally, too, Louis's law is recalled, and it
is shown that all widely prevalent infectious diseases, save those con-
tracted through sexual communion, are diseases of childhood.   So that,
so far from the tuberculosis of childhood requiring some special explana-
tion, it would be odd indeed if tuberculosis were not essentially a
disease of early life.

We then arrive at this extension of von Behring's work, that the
tubercle bacillus is, normally, a parasite of the lymphatic and serous
systems of children.   Phthisis is the escape or extrusion of the para-
sitic bacillus in the interests of its own species.   Some such extrusion
or means of escape is common, of course, to all parasites.   What follows?
During the truly parasitic life of the bacillus, poisons are secreted—though
McConkey does not say this—which affect the life of the host to some
extent ; which produce some at least of the conditions that Poncet
describes ; which are responsible for the production of. " scrofula," and
whose effects represent the " chantage " the host pays the blackmailer
that he cannot completely eliminate through the normal channels for the
elimination of microbic parasites—the bile and intestines.   If there be
not a certain amount of resistance on the part of the host to the para-
site there is either a general invasion of the whole system, with the
production of a " bacillosis," or an acute miliary tuberculosis ; or else
direct extensions through the peritoneum, or lungs, from caseous glands.

Now these views of McConkey, or rather these suggestions of his
which I have somewhat freely interpreted, should be connoted with
a paper by Calmette, which is translated, inadequately I fear, in the

Universal Medical Record for April, 1912, and to which some allusion was made in the *Proceedings* of this Section last March.[1] Calmette, as we all know, does not recognize any natural immunity of the human species in respect of the tubercle bacillus. Whether or no he believes in degrees of susceptibility is another question. All he admits is opportunity, or its lack, for infection; and he maintains that every town-bred child, or nearly every town-bred child, does become infected early in life. If the infection be not too massive, and if reinfections be not too frequently repeated and, as some would say, if the child be not too susceptible (in which case miliary disease supervenes), a degree of immunity is produced which he regards as *tolerance* of the bacillus. Here, then, is Calmette's apparent paradox : immunity from *tuberculosis*—orthodox tuberculosis, not Poncet's—is a matter of tolerance of the bacillus—the parasite.

It is obvious that Calmette recognizes, just as do Poncet and McConkey, a stage of true parasitism extending from early childhood till later, during which there is "immunity" from specific disease, but not, in Poncet's view, from such non-specific manifestations as may be considered to be the levy paid by the host for its immunity from catastrophe. Now Calmette insists, as do many others who have made experiments, that the natural avenue for the elimination of vanquished or dying bacilli is through the bile into the intestines. He regards caseation and suppuration as efforts of the system to eliminate and destroy Koch's bacilli when the ordinary processes of phagocytosis, encapsulation, and elimination through the bile fail to cope with the massive or repeated infections to which some bearers of quiet "parasitic" tubercle bacilli are subjected. He does not, like McConkey, regard excavating phthisis as due to the arrival of that phase in the life-history of the parasite when another host is required, but looks upon the softening of tubercles as a last resort of the patient to expel the pests which are infesting him. He insists on the importance of "reinfections," and speaks of the consumptive patient dying by reason of the very force of his own efforts. In much the same way Boeri, in a recent issue of the *Gazzetta Medica Lombardia*, in speaking of fever, alludes to Victor Hugo's description in "Les Travailleurs de la Mer" of his hero's forces as sustained by fever's fatal aid—"La fièvre le soutienne, un secours qui tue." "Immunity," then, is "tolerance"; phthisis is "intolerance" of the parasite. Gouget, in *La Presse*

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[1] *Proceedings*, 1912, v, p. 166.

Médicale for October 26, 1912,[1] points out that the work of Raubits-chek and others forces us to the conclusion that, in the case of the exotic flora of the intestine, those alone are really immune from the *disease* who are " tolerant " carriers of the *microbes*. Immunity from disease does *not* imply freedom from the bacillus, but toleration of it. As I ventured to say in the course of some " speculative " remarks made in the course of debate before this Section last March, so too with syphilis ; persons who are " cured " are no longer immune, and those who are immune are not really " cured." Calmette's practical suggestion is that, since we cannot hope to destroy the natural sources of the bacillus, or, during urban life, to escape infection, the logical course would be to establish a *modus vivendi* between our children and the parasite by " vaccinating " the former with judicious doses of attenuated organisms, administered *per os* during the early years of life.

At any rate, it seems that we must, more decidedly than of late years, draw a very clear distinction between phthisis and " tubercu-losis." This also is implied, if not definitely expressed, throughout the whole of that series of papers by Robin [2] which have lately appeared in the *Bulletin général de Thérapeutique ;* for Robin lays stress on the importance of treating the " soil " of phthisis. He does not mean by this mere dosing of the patient who has developed phthisis. By " soil " he means the whole or sum of the physical states on which phthisis may become engrafted. Now, while he seems to recognize individual susceptibility to the growth or invasion of the bacillus in a way that Calmette does not, he says that the stigmata of the " soil " for phthisis are practically indistinguishable from those of latent tuber-cular infections. So that when we see a child who exhibits the physical characteristics of one or other of those two types of " scrofula " described by the elder physicians, it is hard to say whether we are observing a morphological variation of the human species that is particularly " susceptible " or that has feeble powers of resistance to the parasite ; or whether we have to do with an expression of the effects on the growing infant of an early lymphatic or serous infection of moderate severity. Poncet would say that the latter is the case. In other words, the " terrain " for phthisis is " para-sitic " infection, in McConkey's sense, of the lymphatic system by the

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[1] *Presse Méd.*, Paris, 1912, xxxii, p. 877.

[2] *Bull. gen. de Thérap.*, Par., 1911, clxii, p. 561 *et seq.* 1912 ; 1912, clxiii, pp. 193 *et seq.*

Bacillus tuberculosis; and scrofula represents a form of very early and more or less resisted infection. We have also to deal with that factor of the " threshold " which is so important. Until the threshold is crossed, infection is tolerated and secures us immunity from overt disease. If the threshold be crossed, we have either, in early life, generalized tuberculosis, or, in later life, phthisis, in its acuter forms. One point more : Calmette says that since on the post-mortem table so many persons exhibit traces of " tuberculization," all men are "tuberculizable." Robin has it that since in so many cases the evidence of such " tuberculization " is trifling, all men are not *equally* tuberculizable. But the difference between them is a mere logomachy.

In this very brief résumé the necessity for compression has led me to do inadequate justice to the authors from whom I have borrowed, and I have, of malice aforethought, omitted all reference to that question of the differences between human and bovine bacilli and infections which cuts across all others. Yet, perhaps enough has been said to warrant me in asking your brief attention to what is really a working model of the tuberculization of communities as well as of individuals. Thirteen years ago I had the opportunity of making some study of the conditions under which phthisis obtains as a cause of death in asylums for the insane. The paper, which has been recently republished in a volume of " Essays," may be found in the *Journal of Mental Science* [1] for 1899. At that time it was admitted that proof had been given that phthisis, as a cause of death, prevailed in asylums to an extent unrealized previously ; and, at first, my further contention that the asylums were responsible for the phthisis was also accepted. But, after a while, some of those who had originally been in agreement were led to accept the notion that since careful post-mortem examination usually showed in the case of those dying of phthisis in asylums some focus of tuberculous disease obviously antecedent to the date of admission, the asylum environment, using the term in its widest sense, should no longer be held responsible for the event. Those who are interested will find abundant controversial material in the *Journal of Mental Science* [2] and *British Medical Journal* for 1900 and following years ; and in Dr. Mott's reports from Claybury. You will remember, too, that Dr. Newsholme, in his admirable treatise, accepted Dr. Mott's point of view, and so far from indicting the asylums, as I had done, exonerated

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[1] *Journ. Ment. Sci.*, 1899, xlv, pp. 657-79.

[2] *Journ. Ment. Sci.*, 1900, xlvi, pp. 1-30.

them : indeed, he proceeded to suggest that they fulfilled a useful purpose by way of segregating persons who were dangerous *qua* Koch's bacillus.   But it was never shown that *phthisis* obtained, on admission, in more than a few of the persons who died subsequently of that disease. The whirligig of time brings its little revenges.   Few to-day would dispute that the "old lesions" found in those dying of phthisis in asylums are other than such as most of us Cockneys carry with us to our graves. And, though no doubt the majority of town-dwellers admitted to asylums are the subjects of "latent" tuberculosis, the responsibility for their *phthisis* lies, if not on the opportunity, as Calmette would say, for massive and repeated infections afforded them, at any rate upon the overcrowding, deficient dietary, and lack of fresh air that still obtain, though perhaps less than formerly, in even the best of these institutions.

In the case of great London asylums, such as Claybury, obviously almost every person admitted is already "tuberculized," in Calmette's sense.   In provincial institutions, however, persons who are not already "tuberculized" are admitted from the fields and from the hills. These persons succumb rapidly, as Calmette has shown; and, as I ventured to say in 1899, it is small wonder that a man taken from the plough to the day-room of an overcrowded asylum should die miserably of phthisis in a year or two.   I venture to think that this question of phthisis in asylums is worthy of more serious attention from epidemiologists than has yet been afforded it, for, as I have already said, it gives us a working model, on not too small a scale, of processes affecting the community at large.

It is clear, however, that not only the question of bovine *versus* human infection, but that of the reinfection in later life of those "tuberculized" in childhood needs investigation.   To what extent is the overcoming, by the bacillus, of the lymphatic and pleural resistances a question of reinforcement of the invaders, or one of flagging of the defence ?   Time may tell us.   But, again, we must draw a clear distinction between tuberculosis—inflammatory, follicular, latent, or occult—and phthisis.   What we are now learning of "tuberculosis" teaches us that between it and "phthisis" there is really a great gulf fixed, which nevertheless, under certain conditions, may be only too easily bridged.   So long, however, as we persist in speaking of phthisis as chronic pulmonary tuberculosis, so long will the real issues be obscured.   For, if we confuse the distinction, we fall into the danger of assuming that all those who die of the rapid forms of phthisis belong to the degenerate or "unfit" portions of the community.   It is not so.

This fallacy of confusing those who die of phthisis with those who are tuberculized, tolerant and poisoned, and perhaps degenerate, comes to light in strange places. Of course, there is further distinction to be made between the physically fit who are "susceptible," because they have not been immunized, and those whose immunity or tolerance breaks down under stress. Yet, all through our consideration of these problems we must not forget that of the threshold, which confronts us in the phenomena of anaphylaxis, in those of the "positive and negative phases," in the Limes null and Limes tod. of Ehrlich, and in countless other difficulties. The little more and how much it is: the little less, and what worlds away! We can never quite escape those eternal paradoxes—the approximation of opposites and the antagonism of similars, even in pathology; while in practical medicine they vex us when we have to decide between the application of an ice-bag or of a poultice. Still, even though it be but one side of the shield, it does seem necessary to urge that, in this case of phthisis and tuberculosis, we should recognize that safety may be found in tolerance, and that overmuch " resistance " may be fatal.

DISCUSSION.

Dr. J. E. SQUIRE said that a paper of this kind was of the greatest value, because many published contributions lost some of their force as isolated papers, and there was a distinct gain by correlating various investigations in this way. A periodic medical stock-taking was most helpful, showing, as it did, the trend of thought and the ideas it encouraged. Dr. Crookshank took as his starting point conditions which had been in existence for many years. The idea that one could not speak of tuberculosis unless giant cells were present was a good many years old, and he thought it was already dead. Those who had long experience with tuberculosis knew that it might assume forms which did not possess what was regarded as the signature of the disease. But one point in the paper required a great deal of thought—namely, the question whether persons who had been infected with the tubercle bacillus, but did not show marked disease, might not, nevertheless, have changes taking place in their tissues as the result of the action of the bacilli and their toxins, which would entitle them to the name "tubercular." He did not doubt that a large proportion of those who without signs of disease reacted to tuberculin tests were of that class; they were instances of an attenuated virus in a resistive body. This idea that the bacillus of tuberculosis could affect the body without producing definite disease was one which, though not new, could well stand emphasis. It could be applied to many conditions other than tuberculous ones, perhaps to most bacillary diseases. In a paper which he published sixteen years ago that idea was set forth in regard to both tuberculosis and

pneumonia. The idea of the present paper, he took it, was not so much to call forth discussion at the moment as to cause members to think and reflect as to the trend of view at the present day ; as such its value could scarcely be over-estimated.

Dr. F. PARKES WEBER agreed that Dr. Crookshanks's paper was one which made persons think, but it was too long for immediate discussion. With reference to the writings of Poncet and Leriche, it was possible for men to make good theoretical suggestions, and yet to adduce cases in support which by no means sufficiently upheld their views. Those who read the accounts of the cases of "tuberculous rheumatism," &c., brought forward before the medical societies of France in support of Poncet's views would agree that many were of the most inconclusive character. In spite of that the theoretical contentions of Poncet and Leriche in regard to the whole subject of "inflammatory tuberculosis" contained doubtless some elements of truth.

Dr. BUCHANAN expressed his agreement with the expressions of appreciation of the paper, especially as it put members in possession of facts and observations which some of them would not have acquired otherwise, as all did not find time to keep pace with the literature of the subject. He wished to ask a question about the inflammatory and other conditions which had been referred to as probably connected with a tuberculous state. If these were so common one would expect to find an excessive proportion of them among children in tuberculous families where the parents suffered from that disease. Had observations been extensively made on that point, and did they bear out this expectation? If those and like conditions must be assumed to be really tuberculous or pre-tuberculous, that must be rather an argument against the adoption of the prophylactic measures against the disease which Calmette recommended. If as the result of vaccinating children with doses of attenuated organism or its poison during early life, children were going to be produced who were weakly, stunted in growth, and liable to those indeterminate inflammatory conditions which might be followed by definite tuberculosis, it would be better to avoid such prophylaxis. He felt also in a difficulty in understanding whether these conditions were to be attributed to the fact that there was a tuberculous toxin affecting the body as the result of the existence of a small tuberculous lesion, or to the existence of bacilli in small doses without any anatomical signature of tuberculosis at all. So far as he had followed the results of animal experiment, especially those of the Royal Commission on Human and Animal Tuberculosis, there had been little or no evidence that the result of inoculation of small doses of tubercle bacilli, even of an attenuated strain, was to produce a pathological condition in which no anatomical tubercles were present. It appeared that if in some circumstances the animal was inoculated with a different strain, such as the bovine with bacilli of the human type, or the pig with the avian. there was a different result ; sometimes no anatomical lesion was found, but the bacilli persisted and could be recovered from the spleen or liver. But when the experiment was done with a type normally virulent for the animal, then, however small the dose, the effect was

shown in anatomical lesions. It would be unreasonable at this stage to ask for proof whether these suspiciously pre-tuberculous or slightly tuberculous conditions were protective or not. On the clinical side the question first arose as to what was the relation between definite glandular and surgical tuberculosis of children, and the occurrence of pulmonary tuberculosis in later life. He had the impression that there was no excessive incidence of pulmonary tuberculosis in children with tuberculous glands and joints, and would like to know whether the evidence went still further in this direction—i.e., that children with, for example, tuberculous spines or hips, were actually less prone to phthisis in later life than the normal population. Assuming this to be so, however, it did not necessarily follow that the minor degrees of tuberculosis—where the disease was merely suspected to be tuberculous or pre-tuberculous—were equally protective ; and again how far was it true, in the case of susceptible animals, that the inoculation of small doses of tubercle bacilli virulent for the species produced tolerance to larger doses administered later on ? A question arose about McConkey's theory as to the reason underlying the localization of the tubercle bacillus in the human being. Dr. Crookshank said he had extended the theory and observations of that author. He (the speaker) had not read McConkey's words, but it occurred to him that perhaps they were not intended to be taken too seriously.

Dr. W. A. BOND desired to congratulate the author on his instructive paper. Taking, for example, small-pox vaccination, it was the inoculation of a small dose of modified small-pox which conferred immunity against further invasion for a series of years, after which lowered resistance or a large dose of the poison broke down the resistance. The same could be said of tuberculosis. The majority of urban children contracted tuberculosis. If only one gland was affected, there was immunity for a time, perhaps until the stress of work or bad surroundings, or both, broke down the resistance, and then phthisis developed. But the prevention of consumption was really an economic problem, intimately mixed up with the proper feeding and housing of the poor. Syphilis and " 606 " might be given as another example. In the spring he heard Dr. Crookshank say that in France when " 606 " was being used, patients after being cured came back with a fresh contraction of the disease, and in some cases this happened three or four times. In the case, again, of measles, there were children having had small doses of the measles poison who got an overdose and showed the symptoms of the disease. When measles first attacked the inhabitants of the Fiji Islands it was very severe, and the death-rate was very high. The author spoke of duplex causations, and he (the speaker) thought that was so with many diseases ; inflammations were produced by a variety of agencies. Mr. Arbuthnot Lane in a very instructive paper on " Intestinal Stasis " stated that he had been able to relieve many tubercular joint conditions by relieving the stasis, either by medicines or by operation. He might add that Mr. Lane also showed that the prevention of constipation was most important in reference to the prevention and cure of other diseases, such as rheumatoid arthritis and cancer.

Dr. HALLIDAY SUTHERLAND, while he much appreciated the paper, was not prepared to admit the novelty of the views set out. A good deal of the teaching, summarized as that of the French school, he had himself received some years ago from Dr. R. W. Philip, of Edinburgh. The paper they had heard would do much to break down the artificial watertight compartments into which different stages of tuberculosis had been erroneously placed. Every stage of the disease was due to the tubercle bacillus, and to associate it with the presence of tubercles was to return to the pathology of Laennec. The early infection of childhood was due to the same morbid cause as was responsible for advanced pulmonary tuberculosis. To an archaic terminology was referable a narrow outlook on this disease. It would be well if they could do something to abolish the term "phthisis." This, according to the text-books, was an advanced pneumonic inflammation of the lung, characterized by râles, consolidation, and excavitation occurring, one was led to believe, in geometrical progression. If that were so, then phthisis was not synonymous with pulmonary tuberculosis. A child was found to have Philip's small glands above the clavicle, impaired resonance, and some diminution of the elasticity of the lung at one apex, associated with a positive tuberculin reaction. To what were these definite clinical signs due, and by what name were they to call this condition? Later on, in the presence of râles and tubercle bacilli in the sputum, the condition was generally recognized. His point was that pulmonary tuberculosis was a disease of infinitely longer duration than was generally admitted, and the key to its recognition lay in the refinement of clinical and bacteriological methods. It was the bacillus, the whole bacillus, and nothing but the bacillus. In every child presenting the signs of what was called a predisposition—long silky hair, long eyelashes, a lanugo-like growth down the spine, &c.—it was possible to demonstrate signs of definite infection. Sixty per cent. of the children of infectious consumptives were infected, while amongst the children of non-infectious consumptives infection was not greater than amongst the children of healthy parents. That was only to be expected, since the mortality from abdominal and meningeal tuberculosis was remarkably high amongst the children of infectious consumptives. Again, the suggestion was that the bacillus might lie latent until, under the stress of life, conditions arose favourable to its aggressive development. In a co-ordinated measure against tuberculosis, such as the Edinburgh system, adequate account was taken of these 'tuberculous seedlings," and of the essential unity of the infective process. To a general recognition of these facts, such analytical papers as the one they had heard to-night were most helpful.

The PRESIDENT (Dr. W. H. Hamer) said that, before calling upon Dr. Crookshank to reply, he would like to remark that he felt great difficulty in understanding precisely upon what evidence the proof of the causal relationship to disease of bacilli, having only " a feeble and furtive existence, here or there," or even no existence at all, was based. Thirty years ago the rules for conducting researches concerning causal bacilli were laid down by Koch, and at

first they were adhered to as scrupulously as Nature observes the law of placing the heart on the left and the liver on the right side; but there had atterly been a tendency to ignore Koch's rules, and some present-day authorities were even exclaiming, with Sganarelle in the play, " We have changed all that." It had thus come about that Poncet and his followers, in considering the question of causal relationship of bacilli to disease, gave their critics considerable cause for complaint. The situation created, indeed, did not greatly differ from that on the croquet-ground in " Wonderland," when, as Alice says, " They don't seem to have any rules in particular; at least, if there are, nobody attends to them, and you've no idea how confusing it is."

· Dr. CROOKSHANK, in reply, thanked those who had taken part in the discussion, but said he was very disappointed in one respect. Two or three speakers thought he laboured under the impression that he was bringing forward entirely new observations. As a matter of fact, much of what he said was already out of date when he was a medical student. His chief object in reading the paper was to show that views which passed as advanced on the Continent, and which had not been accepted in London save by some experts, were really based on observations made long before even the time of Laennec. He knew that Dr. Squire and many others had done good work on these lines; but Dr. Squire would perhaps admit that the views he had expressed twenty years ago had not met with the recognition which they deserved. He asked what text-book of medicine read in London gave an adequate description of the work of Poncet and Landouzy. It was fifteen years since the question of tuberculous rheumatism was brought forward, yet when lately there was a " symposium " at one of the London medical societies on rheumatoid arthritis, and experts from most of the London hospitals were gathered together, the subject was ignored till towards the end of the discussion a general practitioner said he thought there was a scrofulous influence at work in some rheumatic joints. He met with no support. So he (the speaker) thought he had been justified in bringing these notions forward, as new and yet old. Doubtless there had been a continuity of sound clinical opinion from the time of Hippocrates down to that of Dr. Squire to-day, which had kept the light burning. But, so long as in modern text-books tuberculosis was defined as a disease characterized by the presence of tubercles, the bacilloses of Landouzy were out of court. He agreed with what Dr. Parkes Weber had said about Poncet's work; when reading that author's last book, it had seemed to him that some of the cases were supported on almost fanciful grounds, yet one must admit he had got hold of a very fine idea and that there was much truth in what he and his school said, far more than his detractors were willing to admit. He (Dr. Crookshank) was interested in the way that the specialists had come forward and supported Poncet's views. At the meeting of the British Medical Association at Liverpool a French ophthalmic surgeon (Dr. L. Dor[1]) brought forward a number of cases of iritis and keratitis in which there were no tubercles, nor

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[1] *Brit. Med. Journ.*, 1912, ii, p. 1031.

giant cells, nor tubercle bacilli, yet they cleared up under tuberculin.   A celebrated oculist of Amsterdam had recently brought forward as an original notion of his own an elaborate theory of ophthalmic scrofula ; but it was really Poncet's.   Dr. Buchanan had very acutely raised the point that Calmette's notion of vaccination was a matter to be received with great caution in view of Poncet's notions ; the question to be decided was whether it was worth while paying the possible price of some systemic alteration for the benefit that might accrue.   Dr. Buchanan put his finger on one of the weaknesses of Poncet's pathology when he asked whether some of his " inflammations " were consequences of a small tuberculous focus elsewhere, or whether the tubercular poison was supposed to be resident in the lesion itself.   That was the pathological crux of the whole of Poncet's work.   But Poncet had evaded it. Exactly the same difficulty occurred when Landouzy declared most simple pleuritic effusions to be of tubercular origin.   Poncet talked about an attenuated poison, but did not say whether he meant a soluble poison or a definite organism.   Was not the question likely to be solved by finding that the *Bacillus tuberculosis* was a polymorphic organism, as the lepra bacillus was now known to be ?   Mr. Foulerton had in England shown the bacillus to be a streptothrix, and at Davos observers had been working on those lines for many years.   Now we have not only to accept a great deal of Much's work, but to consider the recent reports from Germany of the bacillus having a non-acid-fast phase, as well as a coccus form.   If this work were found to be accurate, many difficulties would disappear.   Dr. Buchanan had asked whether McConkey was serious in speaking about the parasite getting ready for extrusion and so on. It might sound ridiculous, but since it was known how the malarial parasite got ready for the mosquito, and how filaria came out of their lairs at the appropriate time, he did not see why the tubercle bacillus should not be allowed to be at least equally intelligent.   One question that must be settled before one could get much further in the matter was the actual importance of " reinfections."   Calmette insisted on this ; others did not do so.   With reference to Dr. Sutherland's remarks, he (the speaker) appreciated the wonderful work that Dr. Philip had been doing in Edinburgh, and he regretted it was not known better in London.   With deference to Dr. Sutherland, however, he preferred to retain the term " phthisis."   He had not, as Dr. Sutherland thought, suggested that the toxins from a tuberculous mother affected her child in the womb, and so set up the state of scrofula, but the idea that scrofula was the result of the action of tuberculo-toxins on the growing child was, of course, an old one, though, like many old ones, recently revived with fresh justification.

Epidemiological Section.

January 24, 1913.

Dr. W. H. HAMER, President of the Section, in the Chair.

The Behaviour of Diphtheria in Schools.

By J. A. H. BRINCKER, M.B.

IT is proposed in this paper to give some account of the behaviour of diphtheria in London schools. A number have been chosen from those under special observation, and a short history of the epidemic prevalence with the preventive action taken has been added to illustrate the character of each in turn.

The discovery by Klebs that diphtheria was due to a living germ, by Loeffler that this germ could be cultivated outside the body under suitable conditions, the easy methods now available for demonstrating its presence by culture in the throat of the sick, and the more recently gained knowledge of its persistence and reappearance in certain individuals, have placed additional means at our disposal for the control of the disease. Most hospital and local authorities now possess well-equipped laboratories for the diagnosis of diphtheria and its control amongst communities.

Every case of the disease has by law to be notified to the health authorities, who usually possess well-equipped means, such as isolation, disinfection of room and clothing, examination of contacts, quarantine of suspects. They are thus able to deal very effectively with the disease and to prevent its spread. In fact, most education authorities now issue well-established rules and regulations whereby teachers, nurses and others who come in contact with children, are taught the elementary laws which govern infection and epidemiology, and are encouraged to watch for suspicious illnesses and report them to the health authorities. By this means a kind of voluntary and subsidiary notification of

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infection becomes possible. It now only rests with the health and education authorities to collect the information, institute inquiries, and by this and other means at their disposal prevent the spread of the disease at school or the loss of life at home.

It is most interesting to note how the epidemiological characters of diphtheria have changed within living memory. Previous to the eighties diphtheria was a disease of the rural population, but it is now essentially a disease of urban communities. Longstaff, in a paper on the " Geographical Distribution of Diphtheria " (1889), examined the diphtheria statistics of England and Wales for the years 1855-80, and showed that the death-rate was greatest in the sparsely populated districts and least in the densely populated. Since 1880 diphtheria, " which has always displayed a marked tendency to prevail in sparsely populated districts rather than in centres of population, is undergoing a change of distribution, by which the chief urban districts seem to be approaching nearer than before to rural districts in their rate of suffering from this disease." The statistics for diphtheria in subsequent years show a distinct rise in urban populations, and more particularly so in London.

(I) The statistics published by Sir Shirley Murphy [6] make this quite clear : " The well-recognized tendency of diphtheria to spread in schools naturally presents itself for examination, and the new departure I have noted needs to be considered in connexion with the Elementary Education Act of 1870 [6, a]. This Act came into operation in 1870, and since that time children have been increasingly aggregated in schools where opportunity for the communication of the disease from one to another necessarily occurs."

" If increased school attendance has been responsible for the greater incidence of diphtheria in children of school ages, it is to be expected that the increase of diphtheria would in point of time correspond with this increased attendance."

Sir Shirley Murphy gives a table for London for 1871 which shows a notable increase of diphtheria on the age-period 3 to 10 years. This increase, Sir Shirley Murphy adds, " has been maintained more or less ever since, and has in later years been much accentuated." In a subsequent report Sir Shirley Murphy remarks that if the age-period 3 to 15 years be taken, these figures show a similar increase. In this report the figures taken are those for diphtheria and croup, as being more reliable. Later on in the same report Sir Shirley Murphy states: " A further

point consistent with school influence deserves passing comment. It has been pointed out by Dr. Downes that the mortality of females from diphtheria is greater than that of males. Thus in England and Wales in 1861-70 the male death-rate at all age-periods was to the female death-rate as 100 : 108. This difference is more marked at the school age-period of life than at all ages. The statistics of more recent years show that these differences are diminishing, and this might be due to any circumstance, such, for instance, as school life, tending to subject the sexes to more equal conditions.
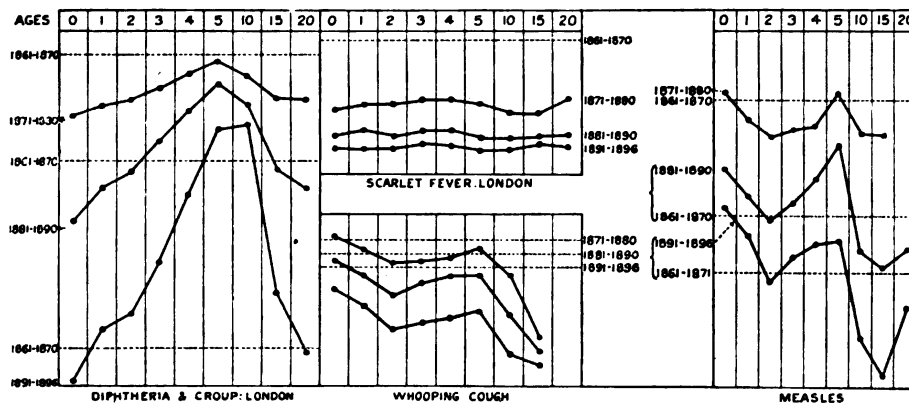
Fig. 1.

TABLE I.—ENGLAND AND WALES.

	Males, aged 3 to 15		Females, aged 3 to 15		Males, all ages		Females, all ages
1861-70	...	100	...	129	...	1C0	...	108
1871-80	...	100	...	124	...	100	...	107
1881-90	..	100	...	119	...	100	...	106

"It is impossible to draw conclusions from these figures only as to how much of the prevailing diphtheria may result from the condition which has thus relatively raised the rate of mortality at the school age-period of life, but it is obvious that disease contracted by children of school age has opportunity for communicating itself to younger and older persons, just as disease contracted by infants and older persons may lead to the infection of children at the school age-period of life."

(II) In 1896 Dr. W. H. Hamer investigated an outbreak of diphtheria in the district of Lewisham [5]. His report on this investigation is a classic worthy of serious study even in these bacteriological days. The same causes which were at work then in spreading

disease are at work to-day, in spite of serum tubes and other modern refined methods of investigation. Reading between the lines of the report we see our "bacteriological carriers," "missed" and "unrecognized cases"—although not known in those pre-bacterial days; Dr. Hamer, no doubt, suspected them, for he refers to such cases under the generic name of "throat illness." The following quotation from his report refers equally well to the behaviour of diphtheria in my set of schools A and B in 1911 as they did to Dr. Hamer's investigation in Lewisham in 1896. Dr. Hamer says :—

"The question as to the part played by personal contagion now requires to be considered. On making inquiry as to which class in the school was attended by the first sufferers in affected households, it transpired that the two schools attended by children suffering from diphtheria were by no means affected equally throughout their whole extent. Thus, limiting consideration always to the case of first sufferers in families, it was proved that the 'girls' attending the *Board School* had suffered to a much less extent than the 'boys' and 'infants,' and, further, that while the upper classes in the 'boys'' school had escaped, the three lowest classes had suffered most severely. In the *National School* the 'boys' had escaped altogether, and so had the upper classes of the 'girls'; the lowest class of the girls had, however, suffered severely, and cases had occurred amongst the infants.

TABLE II.—PERCENTAGE OF CHILDREN IN EACH CLASS ATTACKED (FIRST SUFFERERS).

BOARD SCHOOL.						NATIONAL SCHOOL.					
Boys		Girls		Infants		Boys		Girls		Infants	
Class	Per cent.	Class	Per cent.	Class	Per cent.	Class	Per cent.	Class	Per cent.	Class	Per cent.
1	0	1	0	1 }	7·9	1	0	1	0	1	0
2	0	2	0	2 }		2	0	2	0	2	6
3	0	3	0	3	0	3	0	3	0	3	4
4	2	4	4	4 }	6·12	4	0	4	0	4	0
5	6	5	2	5 }		5	0	5	23	—	—
6	7	6	2	6	4	6	0	—	—	—	—
7	9	7	0	—	—	7	0	—	—	—	—

"Hence in each of nine classes upwards of 5 per cent. of the children were attacked. It will be noted that the boys' department at the *National School* escaped altogether, and that the attacks in the girls' department affected one class only. In the girls' department at the *Board School* comparatively few cases developed, and the last class in this department presents a striking contrast to the corresponding class at the National School. In the infants' department at the *Board School*,

Classes 1 and 2 occupied one room, as did also Classes 4 and 5. Class 6, the 'babies,' had a room of its own, and suffered comparatively slightly, while Class 3, which also had a room of its own, escaped altogether. If the proportion of first sufferers in children attending the nine classes most affected be compared with the proportion of first sufferers in other children of the same age in the affected area in this period, the former group of children will be found to have suffered at a rate eight times the rate of the latter.

" Consideration of what has been stated, and an examination of the annexed table (II), shows that, without doubt, particular classes in these two schools were largely operative in disseminating disease. It is worthy of note that the several departments of the two schools were not equally affected in point of time. The boys' department of the Board School was already involved for more than a week before the special incidence upon the infants' department of the same school, and upon the lowest class of the girls' department of the National School, was developed. It will also be noticed *that cases of* ' THROAT ILLNESS ' *affecting boys belonging to the Board School occurred during the latter part of July.* The history of cases of diphtheria occurring in the affected area for some time prior to the school holidays has been inquired into, and it transpires that children attending both schools had been attacked before the holidays ; *and in some instances there are indications that disease had spread by means of mild cases of illness, the nature of which had not been recognized.*"

Sir Shirley Murphy adds that Dr. Hamer, when directing his attention to ascertain the cause of the outbreak, " found that as long ago as the preceding year the neighbourhood, in which the schools were situated, had begun to suffer from an amount of diphtheria somewhat in excess of that which had been observed in previous years, and in the few weeks antecedent to the August holiday several cases of *throat illness* had occurred among children attending school. Within a fortnight after the schools reopened cases began to manifest themselves among school children, who were the first persons in their respective familes to be attacked. From these facts, ascertained by Dr. Hamer, it is clear that up to the middle of September the incidence of such attacks was mainly on the younger classes of the boys' department of the Board School, and that later the disease affected the infants' department of the Board School and the girls' department of the National School."

(III) Finally, in summing up his report [6], Sir Shirley Murphy says :—

" (1) That with increasing school attendance and corresponding increase of opportunity of infection at school, the result should be manifested in increased incidence of diphtheria mortality upon children of school age.

" (2) The change in age-incidence of mortality had its beginning about the time that compulsory attendance had its beginning.

" (3) This has affected the country as a whole, and has not only been maintained ever since, but has steadily grown in proportion."

It is thus clear that since the passing of the Education Act : (1) diphtheria has become much more prevalent in urban communities ; (2) the age-incidence has fallen very heavily on the younger members of the community (3 to 14), and particularly on infants (3 to 6) [11]; (3) that the opportunities of infection become proportionately greater in a concentrated susceptible community such as obtains in an elementary school ; (4) that infection is spread more particularly by cases of throat illness—that is, by mild and unrecognized cases, or even by those who may show no symptoms whatever.

If we accept these conclusions as true in principle, it follows that all preventive measures, whether already applied to school epidemics of diphtheria or to be introduced at any future time, must be based on a knowledge of these facts. When public health and school doctors undertake to investigate the course of diphtheria in schools swabbing should be applied only secondary to a careful inquiry. Bacteriology is of the greatest value in such inquiries, but it has its limits. It is only after careful inquiry and reconstructing the course taken by an outbreak that the judicious application of bacteriology becomes of the greatest help to aid us in our search for the missing links. We shall then, perhaps, be able to discover the source and the method of spread of infection ; whether by a convalescent carrier, one of Dr. Hamer's cases of " throat illness," a missed case, a precocious carrier, a contact otherwise healthy, or the chronic carrier, whether persistently or only intermittently infectious. But bacteriology must be carefully and rightly applied. Of late years we have learned to understand that there are true diphtheria bacilli and *diphtheroid* germs. We must differentiate between them in the future. Very few, indeed, now believe in the potency of the bacillus of Hoffmann, nor yet in its relationship to the true bacillus of Klebs-Loeffler [4] ; we must learn to neglect its presence. Even amongst the different strains of true bacilli we can appreciate

difference of virulence, and there are some bacteriologists who go so far as to believe that, within limits, there is no relationship amongst these germs. Again, experience has taught us to examine both throat and nose in everyone of our cases. In London this practice has been consistently applied during the last two years.

The literature dealing with diphtheria and its behaviour in schools is extensive, but I propose to refer to the following only.

(IV) One of the first complete bacteriological investigations of diphtheria in schools was carried out by Cobbett [2] during an outbreak of diphtheria at Cambridge, from October, 1900, to January, 1901. " The number of persons examined was 692. Some of them having been tested several times, the total number of examinations made exceeded 950. Among the 692 persons examined there were forty-two notified cases of diphtheria. Besides these there were about twenty-two other notified cases in the town which were sent direct to the hospital without a ' bacteriological examination.' " Amongst the conclusions arrived at by Cobbett were : " The principal means of combating diphtheria are, after the isolation of persons actually sick, the detection of those who go about, apparently in good health, carrying with them the diphtheria bacillus, and the isolation of such persons, and of convalescents from the disease until diphtheria bacilli can no longer be cultivated from them. No doubt the satisfactory isolation of healthy persons who carry the bacillus will often prove impracticable. In such cases the infectious persons should be warned that they are a danger to others, and instructed to take certain precautions. In the case of children isolation will usually be practicable, and experience among the poorer classes at Cambridge has shown that parents can usually be brought to consent to the removal of their children to an isolation home." Again : " With increasing confidence in the bacteriological test on the part of the medical profession and of the general public, such measures will be much facilitated."

In a subsequent paper Cobbett gives an account of a recrudescence of diphtheria in Cambridge during the following spring, and he gives a summary of his conclusions, chiefly in regard to the non-specific character of the Hoffmann bacillus, and to the various strains of *Bacillus diphtheriæ* discovered by him during the epidemic.

(V) Graham-Smith [4], after reviewing the subject up to 1908, states that " The proportion of those healthy persons who become infected

with diphtheria bacilli by contact with patients, and yet do not suffer from diphtheria, depends largely on the intimacy of their connexion with the patients, varying from a mean of 66 per cent. in members of the family, if the conditions for spreading are favourable, to a mean of 8·7 per cent. in the less closely connected scholars in infected schools. The great majority of the bacilli which have been isolated from these contacts and tested on animals have been found to be virulent. In the throats and noses of healthy persons, who have had no opportunity of acquiring them by contact, virulent diphtheria bacilli are very rarely found, but bacilli resembling them in morphology, but differing in being totally without virulence for guinea-pigs, are much more common (2·6 per cent.)"

(VI) In an outbreak reported by A. E. Porter [8] in 1911, he attributed the spread of infection to two cases of chronic nasal car-riers of long standing, who had been in contact directly or indirectly with cases of diphtheria. This outbreak, Porter states, was completely stopped by a vigorous campaign of swabbing and quarantine. It is of interest to note that the bacilli isolated in both these carriers were found to be non-virulent, though it must be recorded that they were not tested until after the lapse of some months.

Thomas [11], from a bacteriological survey of infected London schools, divides germ carriers into the following classes:—

(1) Eighty per cent. were mild and unrecognized cases of diphtheria.

(2) Twelve per cent. were healthy contacts from infected houses.

(3) Six per cent. were cases of intermittent or recrudescent infection after discharge from hospital.

(4) Two per cent. were perfectly healthy cases.

(5) He found the majority of carriers amongst children 5 to 8 years (85 per cent.), rarely amongst " babies " (3 to 5 years). But the heaviest incidence of disease occurred amongst children 3 to 5 years old, with a marked decline for children above 5 years.

It appears as if an increased liability for harbouring the bacillus of diphtheria was directly associated with a decreased susceptibility to an attack of diphtheria. These statistical factors I am able to confirm from a continuation of Dr. Thomas's work.

If, therefore, we are to control an outbreak of diphtheria in an infants' school, even though the babies' class alone may be attacked, it is of the utmost importance to search for bacterial carriers amongst the children in the department between the ages 5 to 8 years.
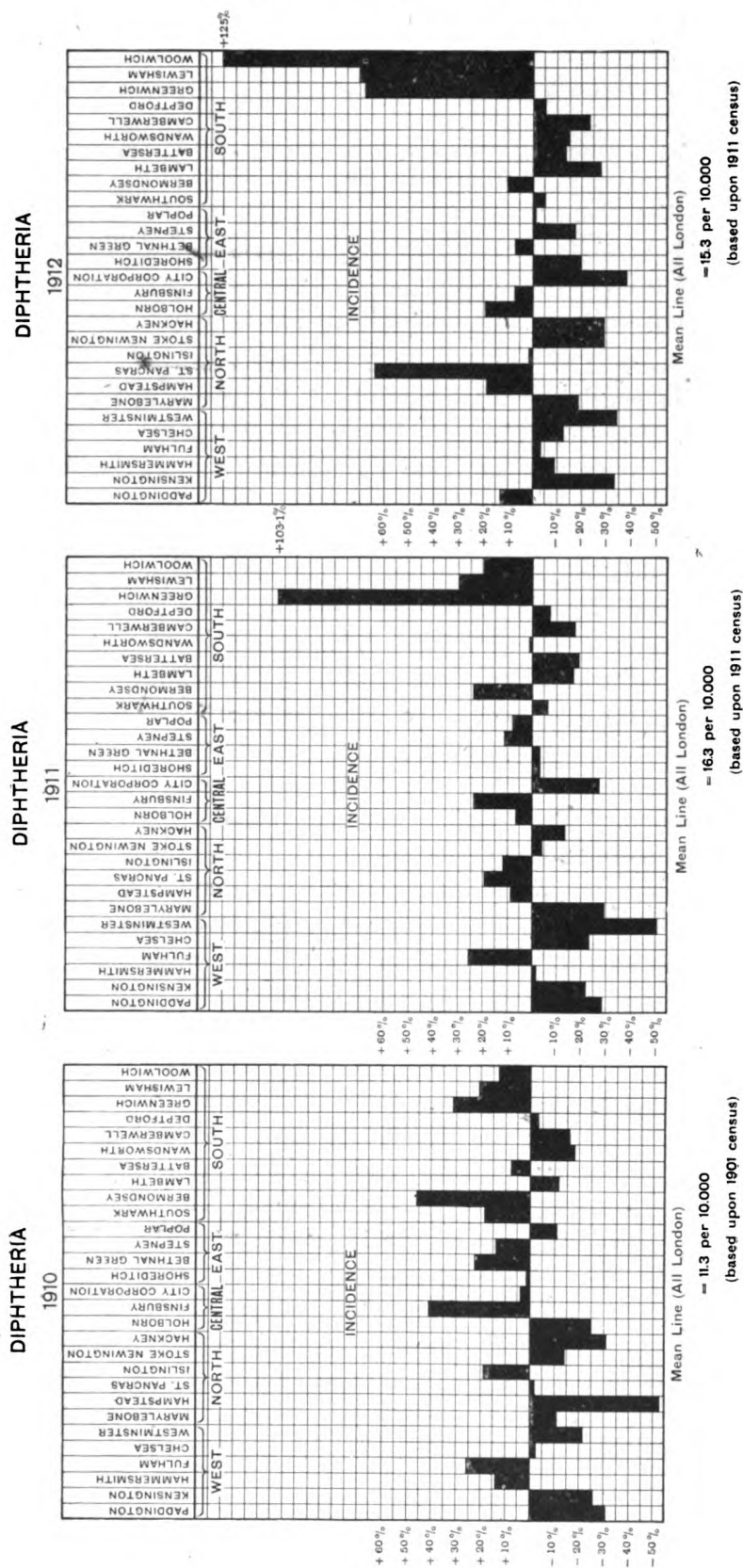
FIG. 2.

TABLE III.—DIPHTHERIA AND CROUP DEATHS PER 100,000 OF POPULATION (LONDON).

Year		Year		Year		Year	
1875	37·7	1885	39·7	1895	56·7	1905	12·2
1876	27·9	1886	34·2	1896	62·0	1906	15·0
1877	23·8	1887	36·5	1897	52·0	1907	17·0
1878	31·5	1888	43·9	1898	40·8	1908	16·0
1879	31·5	1889	43·1	1899	45·0	1909	13·0
1880	29·4	1890	45·1	1900	36·0	1910	10·0
1881	35·2	1891	44·0	1901	35·0	1911	14·0
1882	44·2	1892	52·5	1902	26·0		
1883	45·4	1893	80·1	1903	17·0		
1884	43·1	1894	66·0	1904	16·0		

The years of special epidemic periods of diphtheria in London were 1858, 1861-63, 1875-76, 1892-96. The possible causes which govern these epidemic cycles are interesting, but cannot here be discussed. The reader will find a full account of it in Dr. Newsholme's "Epidemiology of Diphtheria" [7]. Since the last epidemic the incidence of diphtheria has dropped each year, and there has for some years been very little diphtheria in London. As the laws which govern epidemics are as yet little understood, those causes which produce the present freedom from diphtheria are quite unaccounted for, or may only be surmised. But in spite of this general freedom of London from diphtheria it is singular to relate that diphtheria continues to occur with seasonal regularity in certain parts and in certain schools in London. For reasons not understood diphtheria has for some years been endemic in the south-east, more especially in the high-lying, better housed, and newer parts of London. As this applies also to other Boroughs of London at the present time we observe that diphtheria occurs mainly in the outer ring of the County.

I am beginning to believe that the Mendelian law of inheritance of unit characters may be an influencing factor: are we not breeding a race of children particularly susceptible to diphtheritic infection? Probably another causative agent is what may be called the antagonism of germs. We are told by Schiotz [10] and others [1] that the *Staphylococcus aureus* will outgrow diphtheria germs, and apparently diphtheria does not occur amongst the dirtiest members of the community. Another peculiarity of diphtheria is that it may invade a school, and, in spite of the epidemiologist and bacteriologist, will recur with singular regularity for one, two, or more years, and finally disappear altogether.

I now propose to give a short account of outbreaks of diphtheria in six schools in London, and to draw your attention to the outstanding factors in each of them (Tables V and VI, pp. 104 and 105).

(I) SCHOOL A.

During the autumn and winter of 1910-11 this school was entirely free from diphtheria. The first notified case was from room 6 of the infants on April 19. By the end of the summer holidays (July 31, 1911)—that is, in eleven weeks—seventeen cases had been notified in the whole school, with six deaths. Apparently no diphtheria occurred amongst the scholars of this school during the summer holidays, but there is no doubt that a good deal of infection prevailed in the immediate neighbourhood, for between August 28 and November 22 (twelve weeks) twenty-five further cases were notified in the ward in which this school is situated, and of these twelve children attended this school. Six of these twelve children attended room 3 of the infants, and two cases ended fatally. By January 8, 1912, thirty-eight cases had been notified from this school, and of this number thirty-three occurred in the infants' department. Cases of diphtheria still continued to occur in spite of all vigilance and care until July 10, 1912. The school was closed for the summer during August, and has remained free since. The total number of cases notified were :—

					Cases		Deaths
Infants ...	...	...	...	...	48	...	8
Boys ...	...	...	...	..	8	...	0
Girls ...	...	...	...	...	4	...	0
			Total ...	...	60		8

Every care was taken to discover mild, unrecognized, or carrier cases. It was visited on twenty-four occasions, and the children throughout the school examined. As had been the practice of this department for some years, a planting on serum was taken in every case from both throat and nose. Every child found to be carrying Klebs-Loeffler bacilli or germs suspicious of diphtheria was excluded until a satisfactory certificate based on bacteriological examination had been produced. Several cases of clinical diphtheria were discovered attending school and were also excluded. On two occasions children recently discharged from hospital were subsequently found to be chronic carriers. These were re-excluded and kept out of school until the school doctor obtained satisfactory bacteriological results. One, E. L., remained infectious until lost sight of by the end of the summer term.

The cause of the epidemic prevalence of diphtheria in the neighbourhood of this school during the autumn and winter of 1910-11 can only

be surmised, but it is certain that the prevalence during the spring and summer of 1911 was due to carriers of the kind referred to. When swabbing was undertaken on a large scale a number of children who had returned to school either from hospital or with a certificate based on bacteriological grounds were found carrying germs of diphtheria. The preventive measures adopted did not produce immediate relief, for the reason that the infection was too widespread and affected members beyond the control of the school authorities. Had swabbing been carried out at once, after a careful inquiry on epidemiological lines, the epidemic might, as far as we know, have been cut short. Swabbing, to have been of use, would have had to be extended to out-of-school cases also.

(II) School B.

This school is situated in one of the poorer and more congested neighbourhoods of London. The first case occurred early in January in room 3 of the infants, and then spread rapidly throughout the department. As in the first school, it was frequently visited, and the children in all the departments subjected to a frequent and careful scrutiny. Several cases of clinical diphtheria were discovered in attendance, and immediately excluded. It is the practice in all Council schools where diphtheria is prevalent for the teachers to keep a careful watch over the children and to exclude immediately all cases of sore throat or suspicious illness, to notify them to the school doctor and the Medical Officer of Health, and not to readmit them until a satisfactory certificate has been produced. In this school the last part of these regulations was withdrawn, and all suspicious cases were examined by the school doctor himself. It may be mentioned here in passing that diphtheria was at this time also present in other schools in the immediate neighbourhood. This general prevalence, apart from school influence, may therefore be in part responsible for the continuation of the cases in this school.

In all, twenty-nine visits were made to the school; 253 children were bacteriologically tested on 399 occasions, and on fifty-six occasions Klebs-Loeffler bacilli were discovered, and on forty-two occasions suspicious bacilli. When germs suspicious of diphtheria were found in children they were excluded until a further examination had been made.

I have no doubt that both healthy and chronic carriers were responsible for this outbreak. On four occasions secondary cases occurred in the homes of children immediately after the discharge of the first case

from hospital. Three of these primary cases were bacteriologically tested, but gave negative results; but the fourth gave, and continued to give, Klebs-Loeffler bacilli (chiefly from the nose) for about six weeks from the occurrence of the secondary case.

(III) School C.

The characteristics of the outbreak of diphtheria at this school were its suddenness and severity whilst it lasted. At the time no diphtheria had been notified from the neighbourhood. On December 4, 1911, three cases were notified, and by the evening of December 5 seven cases were known to have occurred in this school. All of them came from two class-rooms in the mixed department, the majority from room 5.

Arrangements had been made to visit the school on the morning of December 5. At this visit all the children in the affected classes were examined, and suspicious cases swabbed for bacteriological examination; those absent at the visit were excluded, pending inquiry at their homes by the Medical Officer of Health. The dates of last attendance of the notified cases were as follows:—

One case	...	...	...	...	November	28
Five cases	...	...	...	...	,,	29
One case	...	...	...	...	,,	30
Four cases	...	...	...	...	December	1
Two cases	...	...	...	...	,,	5
Two cases	...	...	...	...	,,	8
Five cases	...	...	...	...	,,	21

Subsequent inquiries pointed to a certain child who, though ill on November 27, continued to attend school until the afternoon of November 29. During these two days he had been attending lessons in two rooms (Nos. 5 and 7), and probably was responsible for most of the cases in these two rooms.

Fifteen children from a neighbouring orphanage attended school until December 1; on this date one of them failed with diphtheria, and the remainder were kept at home; of these, three others failed with diphtheria during the next few days. Teachers were instructed to segregate the classes and to keep a strict watch for suspicious illness, and the two affected classes were closed from December 5 to December 11.

The school was kept under observation and six visits made to detect bacteriological carriers. The infants' school subsequently also became

affected. In the two departments seventy children were tested bacteriologically, and of the eighty-nine tests thirteen gave the Klebs-Loeffler bacillus.

Two carriers were subsequently discovered. One is of special interest for my thesis. He was apparently examined at a period when not discharging diphtheritic germs and allowed to return to school. The following summary gives the important facts of the case: C. C., aged 12. Throat unhealthy on December 5; culture showed Klebs-Loeffler bacillus. December 13: Certificate produced—freedom from infection based on bacteriological grounds—teacher readmitted him. December 19: At my next visit to the school my attention was drawn to this boy. He had no discharge from the nose, but only crusts; boy picked his nose and there was a tendency to bleeding. Bacteriological examination now gave Klebs-Loeffler bacillus in both throat and nose; again excluded. On testing Klebs-Loeffler bacillus from this growth it was found to give the glucose broth reaction and slight virulence to animals. Klebs-Loeffler bacillus was isolated on five subsequent occasions. Those bacilli isolated on January 25 were re-tested: the result was a positive sugar broth reaction, but no virulence for animals. He was allowed to remain at school, but kept under close observation until April. During this time the nasal crusts had disappeared, and though the tonsils were enlarged there was no inflammation. Klebs-Loeffler bacilli were found until March, but by April they could not be found.

(IV) School D.

This outbreak was at first limited to one class-room, attended by boys who had recently been transferred from the infants' school. The corresponding girls and the infants remained free. The outbreak was finally brought home to a boy who was readmitted by a misunderstanding on the part of the teacher, and later again on a bacteriological certificate. He was found to be a carrier. The net result was five notified cases with one death and sixteen bacteriological cases in a class of sixty boys (26 per cent.). I visited the class on nine occasions. At the fifth visit I swabbed every boy in the class, and amongst the apparently healthy found five Klebs-Loeffler bacillus carriers (8 per cent.).

The history of the unrecognized case: C. B., aged 9, was absent from January 20 to February 19 with "chill and bad cold." On February 19 readmitted on producing this certificate: "No signs of diphtheria, bacteriological examination unnecessary." February 23: Re-excluded

on advice of a school doctor. February 26: Readmitted on certificate, which stated "No Klebs-Loeffler bacilli present." As further cases continued to occur in this class-room, C. B. was re-tested on March 20 and found to be harbouring Klebs-Loeffler bacilli. He was excluded and remained out of school until May 24.

Carrier cases therefore are of importance in school outbreaks: the infection not only may be of long standing, but it may also be intermittent in character. The following gives the history of another carrier: As cases of diphtheria continued to occur in a certain school, G., teachers were advised to exclude all cases of sore throat or suspicious illness. A boy, T. R., aged 13, was excluded on January 19 with "swollen tonsils." February 13: Medical Officer of Health took a culture; result, Hoffmann's bacillus. February 24: Medical Officer of Health took a culture: result, Klebs-Loeffler bacilli; parents advised to get the boy's throat treated. March 8: Klebs-Loeffler bacilli still present. March 27: Hoffmann's bacillus only found; no treatment obtained; parents again advised. April 10: Klebs-Loeffler bacilli found, and notified as bacteriological case. April 12: Removed to hospital. April 25: Discharged from hospital with certificate "not diphtheria." May 20: Medical Officer of Health finds Klebs-Loeffler bacilli; tonsils still enlarged; no treatment yet obtained; Medical Officer of Health desires exclusion of other children from home. June 7: Parents not only refuse treatment, but apply for readmission of children to school. Plead boy had no diphtheria when discharged from hospital. June 10: Father writes to Education Authority complaining of the exclusion from school of his children and demanding immediate readmission. Refuses treatment. June 17: T. R. "swabbed" by school doctor; Klebs-Loeffler bacilli found; parents advised to seek treatment. June 26: Boy again "swabbed"; Klebs-Loeffler bacilli in both throat and nose. July 5: Another letter from father asking for readmission of a brother. July 8: Arrangements made at a hospital for enucleation of tonsils. This was carried out. August 26: After holidays all members "swabbed"; no suspicious germs found. August 27: Children readmitted to school.

(V) School E.

Three children attending room 6 of the infants' department were notified on June 13, 15 and 21 respectively. The child (No. 2) notified on June 21 was subsequently found to have had rhinorrhœa for a month, whilst still attending school. She last attended on June 18, and on

June 21 was notified as suffering from nasal diphtheria. On June 6 a niece (aged 15) of the class teacher (M. K.), living at the same address, had also been notified suffering from diphtheria. This girl having only just recovered from rheumatism, had not yet been out of the house. In spite of this case, the teacher continued at her duties until June 17. On this date she was asked to absent herself from

TABLE IV.—DIPHTHERIA INVESTIGATION.

E School.   Infants' Dept.

Seating accommodation in Class-room 4.

The affected children or possible carriers are indicated thus (within the square):—

Diphtheria cases	X.
Bacteriological cases	B.
Sore throat or other suspicious cases ...	S.
Diphtheria in house (=Contacts)... ...	H.
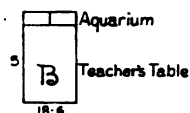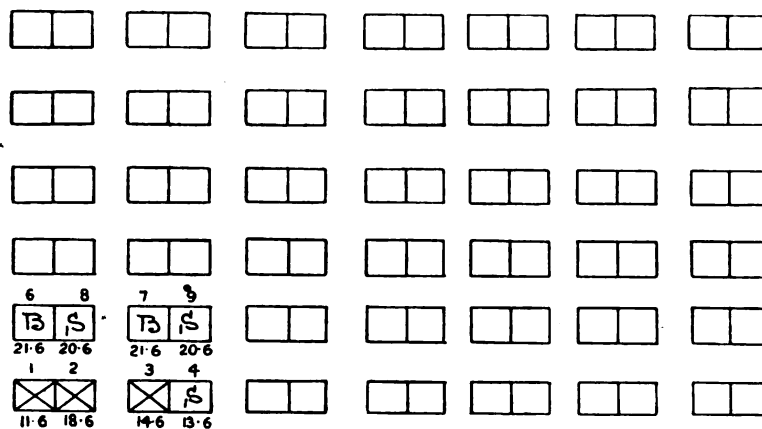
Note.—Each oblong represents a dual desk, and each square a child's seat. The affected children and dates of their last attendance at school are given in each case.

school until a bacteriological examination had been made. She stated that she had had no contact with her niece, and as the latter was immediately removed to hospital and the premises disinfected, she did not stay away from school.

On June 18 she was bacteriologically tested by me. The throat and nostrils appeared quite healthy, but she had Klebs-Loeffler bacilli in

both throat and nose. She was re-examined from time to time after this date, but in spite of local treatment remained infectious until August 23 (sixty-eight days). She resumed her duties after three successive negative results had been obtained. It is quite impossible in this case to say definitely whether M. K. or case No. 2 was the primary case and responsible for this local outbreak.

(VI) School F.

This is a residential school for sixty girls, with a staff of eight adults. The school and its grounds are quite isolated and in good sanitary repair. There is very little opportunity for communication with the outer world. The epidemic history of this school is closely associated with one of the scholars, named R. C. (aged 12), and doubtfully with another, E. M. R. C. certainly was a carrier at some time or another both of scarlet fever and diphtheria, and the chronicity of her infective state still persists and has now extended over an extraordinarily long period.

R. C. was admitted to this school on January 1, 1910. On December 29, 1910, she contracted scarlet fever and was removed to hospital. She was discharged from the Metropolitan Asylums' Board hospital on March 27, 1911. Following the usual custom, she was placed in quarantine at the school. Although apparently well in herself, she was reported to have been discharged with a sore finger which was bandaged. A few days later a portion of bone was removed from the finger. She remained in isolation until April 1, and as she had quite recovered was allowed to mix with the other girls, sleeping in a dormitory (No. IV) with twenty-seven others. On April 3 a girl from this dormitory was isolated on suspicion of scarlet fever; this was confirmed on April 4, and the child removed to hospital. Of the twenty-seven girls occupying Dormitory IV, fourteen contracted scarlet fever, and twenty-one of the sixty girls in the school, while fifteen others were in isolation for some time on suspicion.

R. C. was re-notified and returned to hospital on April 12. She remained in hospital until May 27, 1911. After another fourteen days' quarantine at the school she was allowed to mix with the girls in Dormitory IV. On July 27 a girl from Dormitory IV was notified with diphtheria; arrangements were made for immediate segregation and bacteriological examination. The next day another girl from the same dormitory was isolated with sore throat, and a bacteriological examination showed the presence of Klebs-Loeffler bacilli

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She was notified and removed to hospital. The result of the bacteriological survey was :   Twenty-five girls (42 per cent.) were found harbouring Klebs-Loeffler bacilli, four only showed Hoffmann's bacilli, and twenty-nine gave a negative test.   Those showing Klebs-Loeffler bacilli were segregated as far as possible, kept under observation, and retested from time to time.   With two exceptions most of the twenty-five cases harbouring Klebs-Loeffler bacilli cleared up rapidly under treatment.   They were R. C. and E. M. : it was considered advisable to notify them and send them to the hospital as bacteriological cases.   R. C. was removed on August 16 and E. M. on August 18. By August 28 all suspicious cases had cleared up, and the school was declared free from infection.

R. C. returned from hospital on September 2, placed in quarantine, and a swab taken.   Klebs-Loeffler bacilli were found, and she returned to hospital on September 3, 1911.   On November 2, 1911, she was discharged, and returned to the school.   The first two swabbings gave negative results, but the third, fourth, fifth, and sixth showed Klebs-Loeffler bacilli.   She was re-notified and removed to hospital on November 11, 1911, where she remained until April 4, 1912.

Meanwhile, E. M.' had also been discharged from hospital on November 8.   On this date the bacteriological test was negative, but on November 11 suspicious germs, and on November 15, 16, and 17 Klebs-Loeffler bacilli were discovered ; but as she had been isolated with R. C., she may have been infected by her.   She returned to hospital on November 17 and remained there till January 15, 1912. On returning to school she remained in quarantine for fourteen days, and having given two sets of three successive negative tests, was allowed to mix with the rest of the girls after a prescribed form of disinfection had been carried out.

R. C. returned to school on April.4, and was placed in quarantine. Klebs-Loeffler bacilli were obtained in the first culture taken from both the throat and from each nostril.   As she had now been in hospital as a diphtheria carrier on three occasions since August 16, 1911, it was considered advisable to watch her in isolation at the school for a time.

The plantings taken from the throat and nose of April 12 were sent to the Lister Institute for examination.   An abstract of the report is as follows :—

R. C. : Pure culture of *Bacillus diphtheriæ* obtained from nose and throat.   No difference recognized between the two strains.   Both fer-

mented glucose, but not sucrose. Hence a true *Bacillus diphtheriæ*. Virulence test : $\frac{1}{10}$ c.c. broth culture injected into guinea-pig—alive after three days ; 2·5 c.c. broth culture injected into guinea-pig—died in two days. Control : 3 c.c. broth culture, + $\frac{1}{10}$ c.c. antitoxin, injected into guinea-pig—alive. The bacillus is therefore of a strain of no great virulence.

Three sets of bacteriological tests were made each week from R. C.'s throat and each nostril. Sometimes all, at others one or two, showed Klebs-Loeffler bacilli : that is, if the throat proved negative Klebs-Loeffler bacilli could be recovered from one or both nostrils, but Klebs-Loeffler bacilli were always recoverable from R. C. during the period April 5 to May 31.

(II) On June 2 a girl in the school was isolated on suspicion and on June 3 she was removed to hospital suffering from diphtheria. Under the circumstances it was most advisable to take no risk, so R. C. was sent back to hospital. Once more the school was placed in quarantine and a bacteriological survey made of the whole school. The net result was that one girl, E. M., was found to give Klebs-Loeffler bacilli repeatedly and six others showed suspicious germs. R. C. and E. M. were sent to Tottenham Hospital on June 3 and the remaining six were isolated and discharged as soon as clear. Since the departure of R. C. and E. M. this school has enjoyed a clean health bill.

E. M., it will be noted, is the same girl who had previously been sent back to hospital. Whether she also was an intermittent and chronic carrier and the probable cause of the second outbreak in the school is difficult to say.

The subsequent histories of these two girls is an object-lesson. I am indebted to Dr. Frederic Thomson for the information. Between June 3 and June 28 no suspicious bacilli were recoverable from either R. C. or E. M.; but a report of June 28 states that Klebs-Loeffler bacilli had been recovered from both R. C. and E. M. Dr. Cartwright Wood reported them non-virulent, but he adds that it does not follow that virulent bacilli may not also be present. On July 4 Dr. Thomson wrote to say that the virulence of each would be tested every fortnight.

Report of August 13.—R. C.: Klebs-Loeffler bacilli isolated from both throat and nose; reaction—Neisser +, Gram +, sugar broth +, animals 0. E. M.: Klebs-Loeffler bacilli isolated from throat only; reaction—Neisser +, Gram +, sugar broth +, animals 0.

Report of October 11.—E. M. now fails to give Klebs-Loeffler bacilli. She returned to school on October 19 and was kept in quarantine until

TABLE V.—DIPHTHERIA CASES IN SCHOOLS.

School	Boys' Department								Girls' Department								Infants' Department								Remarks
Class	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	
Age	—	13-14	12-13	11-12	10-11	9-10	8-9	7-8	—	13-14	12-13	11-12	10-11	9-10	8-9	7-8	7-8	—	6-7	6-7	5-6	5-6	4-5	3-4	
(I) A	—	—	1	—	1	1	2	3	—	1	—	—	—	—	3	—	7	—	8	3	10	10	5	5	First case, Infants, room 5, May 8, 1911; last case, room 8, July 10, 1912
(II) B	—	—	2	1	—	1	—	1	—	1	2	—	—	4	2	—	—	9	4	7	6	4	4	1	First case, Infants, room 6, June 19, 1911; last case, room 6, July 1, 1912
(III) C	—	—	—	—	—	—	—	—	1	—	1	2	4	1	10	1	4	—	—	—	—	1	—	2	First case, Mixed, room 5, Nov. 29, 1911; last case, room 7, May 3, 1912
(IV) D	—	—	—	—	1	1	—	7	—	—	—	—	1	—	—	—	1	1	—	—	1	1	—	1	First case, Boys, room 8, Jan. 19, 1912; last case, room 8, May 3, 1912
(V) E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	5	1	1	—	—	First case, Infants, room 4, Jan. 12, 1912; last case, room 4, May 3, 1912
(VI) F	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	First case, Infants, room 4, Jan. 12, 1912; last case, room 4, June 18, 1912; M. K. discovered +;excluded June 17, 1912

Mixed Department (School III C).

4 cases—Dormitory IV, 3 cases
,, III, 1 case

TABLE VI.—BACTERIOLOGICAL TABLE.

Schools	Depart-ments	Class or classes	Number of visits	Between these dates	Number of children bacterio-logically examined	BACTERIOLOGICAL ANALYSIS					Remarks
						Number of examin-ation	Klebs-Loeffler bacilli	Suspicious organisms	Hoff-mann's bacilli	Negative	
(I) A ...	Boys, Girls, and Infants	All	24	July 17, 1911, and June 3, 1912	233	334	36	32	39	227	Throat and nose examined in every case
(II) B ...	Boys, Girls, Infants, Mixed	All	29	January 24, 1912, and July 17, 1912	253	399	56	42	43	258	Visits to Boys, 12; Girls, 16; Infants, 22; Mixed, 1
(III) C ...	Mixed and Infants	All	6	December 5, 1911, and April 25, 1912	70	89	13	5	1	70	—
(IV) D ...	Boys	No. 8	9	February 1, 1912, and June 21, 1912	82	146	20	5	126	—	—
(V) E ...	Infants	No. 4	2	June 21, 1912, and June 28, 1912	16	21	—	2	7	12	—
M. K. ...	—	—	8	June 6, 1912, and August 26, 1912	—	8	5	—	—	3	M. K.'s niece notified △ June 6, 1912 (out of school case); M. K. excluded, June 16, 1912
(VI) F ... (1) First outbreak	Girls	All	21	July 31, 1911, and August 28, 1911	60 (+ 8 adults)	276	60	5	23	188	The children gave these results: Klebs-Loeffler bacilli, 31 children; Hoffmann bacilli, 4 children; negative, 29 children
(2) Second outbreak	Girls	All	—	June 5, 1912	60	85	3	5	18	59	Analysis in regard to children gave these results: Klebs-Loeffler bacilli, 3 children

October 29. As she continued to give satisfactory bacteriological results she was allowed to resume her schooling on October 30. R. C. continued to give Klebs-Loeffler bacilli results until December 15, 1912. From December 15 to January 15 tests from R. C. for Klebs-Loeffler bacilli were all negative, but since January 16 they have reappeared and Dr. Thomson states they are now plentiful. The diphtheria bacilli from R. C. have been tested for virulence on several occasions since July, 1912, and were found non-virulent except on one occasion, November 5, 1912, when the bacilli from the nose were found to be virulent.

R. C. is therefore the most remarkable chronic but intermittent carrier I have met. She has been responsible for one outbreak of scarlet fever and probably two of diphtheria within a period of fourteen months ; she has, moreover, been a carrier of diphtheria bacilli for at least nineteen months, yet there is no history that she ever suffered from any symptoms of the disease.

The *carrier* problem is, therefore, of greatest importance in the control of diphtheria. But these carriers may vary between very wide limits. A carrier of this disease may never have suffered from diphtheria, even from a mild sore throat; the mucous membranes may appear normal, and the Klebs-Loeffler bacillus may only be intermittently recoverable. Some six years ago, when working in the Croydon Borough Hospital, I was able to demonstrate the Klebs-Loeffler bacillus in the finer branches of the crypts of a tonsil enucleated from a chronic carrier. Not only may the germs of infection be dormant in the tonsils, but they may be found in situations difficult or impossible to reach, such as the antrum of Highmore, or in the frontal or ethmoidal sinuses.

Other factors which influence the control of diphtheria in school are :—

(1) Inability to follow up and examine absentees before returning to school.

(2) Impossibility of examining contacts outside school age.

(3) A single examination from a suspect, or an examination from the throat alone or nose alone, is insufficient evidence to warrant freedom from infection.

(4) Possibility of failing to recognize a carrier in school who appears quite normal.

(5) Opportunity in London school children of infection and re-

infection—Sir R. Thorne Thorne has called it "the rough and tumble play" outside school.

(6) Absence of control over Sunday schools, "happy evenings," and similar institutions.
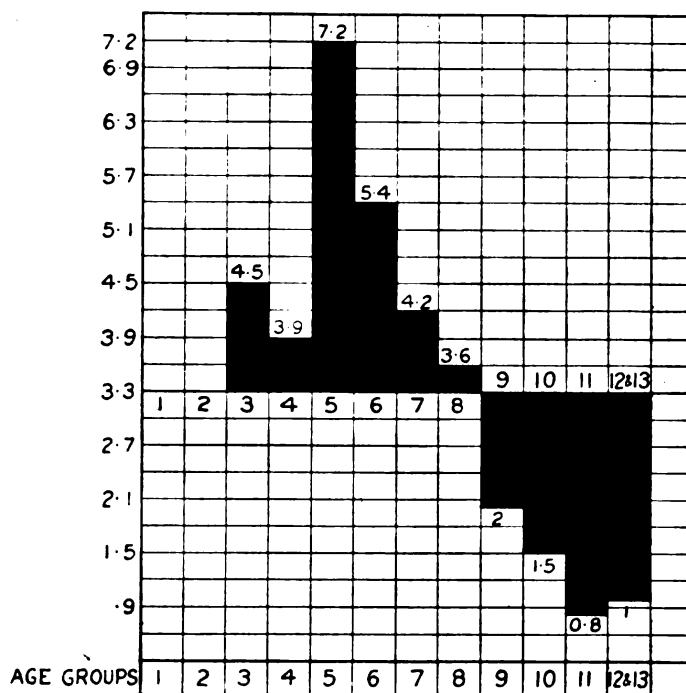
FIG. 3.

Percentage incidence of diphtheria in five schools, A—E.

TABLE VII.

Age distribution		Total school population		Total diphtheria cases		Percentage incidence
3 to 14 years	...	4,708	...	159	...	3·3
12 and 13 ,,	...	794	...	8	...	1·0
11 ,,	...	348	...	3	...	0·8
10 ,,	...	460	...	7	...	1·5
9 ,,	...	390	...	8	...	2·0
8 ,,	...	465	...	17	...	3·6
7 ,,	...	816	...	35	...	4·2
6 ,,	...	498	...	27	...	5·4
5 ,,	...	488	...	35	...	7·2
4 ,,	..	255	...	10	...	3·9
3 ,,	...	194	...	9	...	4·5

(7) Possible return of infectious cases from hospital; or more likely a possible recrudescence of infection after returning from hospital.

(8) Difficulty of obtaining certificates based on bacteriological analysis. Even these have been found unreliable.

(9) Great proportion of purely nasal carriers : possibly with membranous rhinitis, or merely scabs or excoriation round the nostrils.

(10) Difficulty of impressing on teachers the importance of excluding all cases of suspicion, and not readmitting them until a satisfactory investigation has been made.

In conclusion, what can be done for the chronic carriers of infection ? We have seen how persistent the infection is and what little effect treatment has upon them. If the germ is a virulent one, it is clear that the best laid schemes of public health and education authorities will not prevent the occurrence and recurrence of cases of diphtheria. All manner of means have no doubt been tried to render carriers harmless, such as disinfectants, antitoxin, antidiphtheritic serum, autogenous diphtheria vaccines [3], improved conditions of health such as change of air, feeding. On the surgical side removal of unhealthy growths and enucleation of tonsillar matter have proved successful in some cases only. It is, therefore, clear that the means of treatment at present available are disappointing. Any new suggestions should, therefore, be put to the test. A method of treatment suggested by Schiotz [10], of Copenhagen, and subsequently tried in America [1], is one which appears hopeful, and could be tried on selected cases. A twenty-four-hour broth culture of *Staphylococcus aureus* is applied two to three times daily to the throat and nose in the form of a spray.

REFERENCES.

[1] CATLIN, SCOTT, and DAY. (a) *Journ. Amer. Med. Assoc.*, Chicago, 1911, lvii, p. 1452 ; (b) DE WITT, LYDIA, *Journ. of Infect. Dis.*, Chicago, 1912, x, pp. 24-35.

[2] COBBETT. *Journ. of Hygiene*, Camb., 1901, i, pp. 235-59.

[3] FORBES, DUNCAN, and NEWSHOLME, H. P. *Lancet*, 1912, i, p. 292.

[4] GRAHAM-SMITH. *Journ. of Hygiene*, 1902, ii, pp. 170-93 ; 1904, iv, pp. 258-327 ; and " The Bacteriology of Diphtheria," Camb., 1908 (Nuttall and Graham-Smith).

[5] HAMER, W. H. " Diphtheria in Lewisham," November, 1896, London County Council, "Annual Report of Medical Officer of Health, 1896," Appendices ii, iii.

[6] MURPHY, Sir SHIRLEY. (a) " Preliminary Memorandum by the Medical Officer (L.C.C.) on the Increase of Diphtheria in London " (March, 1894), pp. 1, 5 ; (b) " Diphtheria and Elementary Schools," July, 1898.

[7] NEWSHOLME, A. " The Epidemiology of Diphtheria " in " The Bacteriology of Diphtheria," 1908 (Nuttall and Graham-Smith).

[8] PORTER, A. E. *Public Health*, 1912, xxv, pp. 224-31

[9] POWER, W. H. Local Government Board (Report of Medical Officer), 1882, p. 52 ; 1883, p. 42 ; THORNE, R. THORNE, " Diphtheria " (Milroy Lectures), 1891 ; MURPHY, Sir SHIRLEY, *Public Health*, 1891-92, iv, pp. 71, 72.

[10] SCHIOTZ, A. (a) " Cure of Chronic Diphtheria Bacillus Carriers," in " Uskadeliggorelse af Infectionsbaerere ved Diften," 1910 ; (b) *Journ. Amer. Med. Assoc.*, 1912, lviii, p. 422, gives a short summary of (a).

[11] THOMAS, C. J. (a) " Report of School Medical Officer (L.C.C.), 1904 " ; (b) *Brit. Med. Journ.*, 1904, ii, p. 431.

DISCUSSION.

The PRESIDENT (Dr. W. H. Hamer) said it was now thirty-seven years since Mr. Power wrote his report on diphtheria at Brailes, a report which, as the reader of the paper would say, possessed a certain amount of interest, even in these bacteriological days. It was printed by the Local Government Board, but was not easily accessible, as it was not reproduced in the Annual Report of the Medical Officer of the Board. It was succeeded, however, by the classical report on diphtheria at Pirbright. These reports first called attention to the importance of school influence. Nineteen years ago Sir Shirley Murphy first tackled the question of the statistics of diphtheria in big urban communities. Sir William Power was not present, but, fortunately, Sir Shirley Murphy was, and he would ask him to open the discussion.

Sir SHIRLEY MURPHY desired first to say a word as to the value of Dr. Brincker's paper. He regarded it as a most excellent statement of the behaviour of diphtheria. The author had treated the subject in a very judicial way, and his method of examination of the facts had conveyed an important lesson. With regard to Dr. Brincker's quotation from his (Sir Shirley's) reports a number of years ago, as to the alteration of the age-incidence of diphtheria coinciding with the passing of the Elementary Education Act, since that was written he had had, of course, the opportunity of working at the subject further, and six years ago he gave a paper to the Epidemiological Society,[1] in which he submitted a further explanation of that coincidence. The change in the age-incidence he regarded as due, in the main, to a variation in the infectivity of the disease. There seemed good reason for thinking this variation was cyclical, and that, apart from the Elementary Education Act, there would have been an increase in the diphtheria mortality at school age. Naturally, the more children were congregated in school, the greater would this increased infectivity be manifested. He regarded this change of infectivity as a greater factor than the passing of the Education Act. The study of the change of age-incidence was a most important one in watching over the diphtheria of a district. Dr. Brincker had told of cases bearing no conspicuous sign of the disease. So there might be cases in a locality not associated with any recognized cases in the same class-room, but infected at school; and the test as to whether the school was doing mischief was the test of the age-incidence of the cases. When he had the pleasure of working with Dr. Hamer at the London County Council, if there was an increase of diphtheria in a locality, the first thing they did was to take out the ages of the children attacked, and finding that the result suggested that infection at school was operative, they at once pointed out the need for further inquiry into that question. Dr. Brincker's statement about the growth of diphtheria in a locality was of much interest. He had himself watched it many times in Lewisham, Woolwich, and other places. The schools were not, at the time, openly accused of causing the mischief. Perhaps if one came to look at the

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[1] *Trans. Epid. Soc. Lond.*, 1906-07, n.s. xxvi, pp. 99-109.

relationships in the school of the children who were being attacked, one did not find it was an intimate one; the fact being that the infections were due to unrecognized cases in different classes. With regard to the question whether, with the bacteriological methods now possessed, the prevalence of diphtheria could be controlled, the effect of the author's statement seemed to be that this method often failed. It was hoped knowledge would advance, but it seemed to come to this at present, that when there was persistent diphtheria in a locality in which a school was involved, the only thing to be done was to close the school. It did not seem that one could always rely on the bacteriological method as a sufficient way of dealing with the matter. With regard to the effect of schools in disseminating diphtheria, he had many times referred, in his annual reports, to the marked depression in the seasonal curve of cases of diphtheria in the holiday month of August. Two objections had been taken to the hypothesis that it was due to cessation of infection at school: First, that it was due to the exodus of children from London in August. To that there was a complete answer in the curve which Dr. Newsholme published in his return, showing the cases of notified infectious disease in the whole country. When the whole of the cases were plotted out it was found that the August depression in the curve was pronounced. So if it was a question of exodus from London it must be exodus from England. The second objection was that the cessation of notifications in August was largely due to the cessation of observation on the part of school officers. But to that also there was a complete answer, for the annual summary of the Registrar-General for 1910, based upon deaths, showed the same depression occurring a little later, just as deaths occurred later than attacks. Whatever influence cessation of observation could have had on the curve of notifications, it could not have influenced the curve of deaths. He was convinced with the author that the great work in regard to diphtheria in urban localities was to consider its aspect in relation to schools.

Dr. W. G. SAVAGE also expressed his appreciation of the valuable paper. One impression from it was that if bacteriological methods were to be applied, they must be carried out thoroughly. That was all the more necessary as every now and then people were found willing to disparage bacteriological methods in diphtheria, and to prefer epidemiological methods, though he had never satisfied himself that they had applied bacteriology thoroughly. The nose as well as the throat must be swabbed, as the author pointed out. He was glad to see the importance of a general study of the incidence emphasized as required before the application of bacteriological methods. It was very important that all suspicious cases should be followed up, and in rural and semi-urban districts the advantages of a school nurse for that purpose were great. In several small districts in Somerset where there was diphtheria they had only been able to grapple with it when, on his advice, the services of a trained nurse were obtained to follow up every case of suspicious illness, and report them for bacteriological examination. With regard to the expedient of closing the schools, that might be necessary, but in regard to diphtheria it

should not be indiscriminately resorted to, because the school formed a convenient centre for investigation. In rural districts closure of the school because of a few cases of diphtheria might be actually disastrous owing to the greater opportunities enjoyed from playing more freely together out of school. He had several times found that when an outbreak was diminishing one could often judge that it was so diminishing by the fact that the children no longer were chiefly attacked, but there was a high proportion of cases amongst adults. He had noticed the same fact also in scarlet fever. He had no explanation to offer. It could not be due to exhaustion of material, because, as a rule, only a small proportion of the possible cases had been affected. A further point brought out in the paper was what he might express as the short striking distance of diphtheria. It would be noticed in the paper read how frequently the associated cases were confined to classes ; they were not scattered through the school. It was important to remember this fact when opposition to bacteriological methods was put forward on the ground that all the children in the school could not be swabbed, therefore what was the good of trying to control the disease by bacteriological methods ? The answer was that it was the children sitting near the infected child, and the home contacts which needed bacteriological investigation. If they were very carefully watched and promptly examined much could be done to prevent an outbreak of diphtheria in the locality. He could say that after ten years' experience of bacteriological methods. The author of the paper had referred to the difficulty of dealing with persons harbouring diphtheria bacilli, and the impossibility of artificially hastening the elimination of those bacilli. It was a great problem how to deal with these contacts ; the law did not provide for them or recognize their existence. An alteration in the law to include carriers was most urgently required. When he had charge of a fever hospital he tried all sorts of measures to get rid of the bacilli, but he never satisfied himself that his measures hastened their disappearance, apart from one instance in which he removed greatly enlarged tonsils, a proceeding which cut short the infectivity of a case which had lasted for months. From the removed tonsils he was able to cultivate the bacillus from one of the crypts, at least one-third of an inch from the mouth. He also demonstrated the bacilli in the tissue well away from the lumen of the crypt. If anyone could come forward with a reliable means of getting rid of the bacilli from carrier cases, he would do much to assist in the prevention of this disease.

Dr. DAVIES also desired to thank Dr. Brincker for his paper, the careful records of which would be useful to members in the future. He had been disappointed with routine swabbing as he had carried it out in Woolwich. He agreed, generally speaking, with what had been said about neglecting Hoffmann's bacillus, but one of the author's own cases showed the desirability of not neglecting it altogether. Where on one occasion the case was reported with Klebs-Loeffler bacillus, the next fortnight with Hoffmann's bacillus, and a fortnight later again with Klebs-Loeffler—not both together on any occasion—it was suspicious ; it looked as if Hoffmann's bacillus had been mistaken for the

Klebs-Loeffler. In regard to the sentence,"It appears as if an increased liability for harbouring the bacillus of diphtheria was directly associated with a decreased susceptibility to an attack of diphtheria " (p. 92), should not that be a *severe* attack of diphtheria ? The author seemed to think that the disease prevailed more in the better-class districts of London, but in making such comparisons one must be quite clear what one meant by diphtheria ; did it mean mortality, or cases ? On examination, differences might be found largely to disappear. If notified cases were meant, probably Dr. Brincker was right, but not deaths, because on looking at the Registrar-General's returns, 1906-10, he found that the four boroughs with the highest mortality from diphtheria were Fulham, Stepney, Finsbury, and Poplar, three of which were admittedly not the cleanest or richest boroughs in London. The notifications depended largely on the activity of the particular Medical Officer of Health and certain other persons. His impression had at first been the same as Dr. Brincker's, that the disease attacked mostly the better-class schools, but after a series of years he found it was not so altogether. He noticed that the children in the district of the poorer schools got mild forms of the disease, often not notified before school age, to a larger extent than was the case in the districts of the better schools, therefore the poorer schools were better protected against an attack than the better ones. Still, there might be a good deal in the suggestion that the staphylococcus exerted a satisfactory effect on the diphtheria germs. There had just been an epidemic of diphtheria in Woolwich, and in the last five months 279 cases had been notified, but only twelve deaths, or 4 per cent. There were sixteen cases in August, forty-three in September, forty in October, fifty-five in November, eighty-nine in December, but so far this month only thirty-six. For several years in Woolwich it had been the practice to swab all home contacts of school age, and the swabbing was repeated every fortnight until a negative result ensued. Usually one had to be content with one negative result. So far as he knew, Woolwich was the only London borough in which the practice was carried out systematically ; therefore it was very disappointing to find, after five or six years, that Woolwich still had more diphtheria notifications than most other London boroughs. For a month or two there was an extraordinary number of positive results in contacts who were mainly healthy : 245 contacts were examined by himself. During August, out of twenty, eight were positive ; in September, four out of twenty-nine ; in October, two out of fifty. In November, out of fifty swabs, fifteen were positive ; in December, out of forty-nine, thirty were positive. He did not know what was the explanation of this great temporary susceptibility to become carriers of diphtheria bacilli. In January, on the other hand, out of thirty-nine cases swabbed, only three were positive. Out of sixty-two positives, thirteen had slight symptoms (he was not including enlarged tonsils), and forty-nine had no symptoms. Out of 162 negative cases, thirty-three had some symptoms, 129 had none. Only twenty-one had Hoffmann's bacillus present, which was much below the usual proportion. He had begun to wonder whether routine swabbing of school contacts was of value. It had been suggested that carrier

cases, after a certain number of weeks, ceased to be virulent. He did not know what was meant there by " virulent," but it was shown that after a considerable time they could continue to infect other persons. His experience made him feel the extreme difficulty of dealing with the subject on bacteriological lines.

Dr. ARNOLD said he had listened to the paper with great interest. One point which always struck him in discussions in which bacteriological investigations were mentioned was that there was a distinct difference between the tone in which bacteriological diagnosis was spoken of, and that of diagnosis by other means. When one came to the case of tuberculosis, for instance, it was freely mentioned that the diagnosis was made by a physician of high standing, that various signs were obtained, and that therefore it was evident the case was one of tuberculosis. But when speaking of swabbing, as a rule nothing more was said, except that the result was either positive or negative. He referred to a statement by a man for whose experience and opinion he had great respect, who said he did not think anyone had a right to return a negative result without half an hour's careful examination of the film, and even then the tube should be re-examined the next day. No doubt he was right, from the bacteriologist's point of view, but when dealing with large outbreaks that standard could not be kept up. The result was that he looked upon a bacteriological return as one which was of assistance, but was not definite. He had just seen a fairly extensive outbreak of diphtheria, and one heard so often that outbreaks were spread in schools, that he would like to relate an experience he had had in the last twelve months. In a town of 170,000 inhabitants, and 9,000 acres in extent, during the first quarter of the year the number of positive swabs was 5 per cent. to 7 per cent. of those examined. It was a town in which swabbings were taken very freely. In the second quarter, the number increased considerably, but it did not attract any great attention. The positive swabs rose to 15 per cent. of those examined. In the third quarter, a very large number of cases occurred, but they were all mild throughout, and the case-mortality never rose. In fact, the death-rate for the whole year had been practically unaffected. In the third quarter the positive swabs were 21 per cent. of those examined. In the fourth quarter all the cases seemed to disappear rapidly. Eight hundred cases were notified in the year. But the cases occurred so uniformly over the whole borough that they might have been distributed with a pepper-box. School influence could not be traced. There were thirty-three schools in the borough, and here and there cases attending certain schools increased rapidly for a short period, but there was nothing more, and the disease remained of the mild type.

Dr. THOMAS said that formerly when he had considerable opportunity to become acquainted with the methods of spread of outbreaks of diphtheria his conclusion was that the detection of the bacillus, and the isolation of the child carrying it, was not everything in the cure of diphtheria. He had watched in a school, over long periods of time, children with virulent bacilli in their

throats, and though they had been left in the school, nothing had happened beyond slight attacks of sore throat in children sitting on the same benches, or in close contact with them. There might be a few sore throats from which diphtheria could be cultivated in the week, and they would disappear for a time, but clinical diphtheria did not seem to break out. But if notification of these sore throats were adopted, there might be a larger apparent outbreak. Under other circumstances a carrier would produce a definite outbreak of the disease, with, perhaps, many deaths. It almost seemed as if people with mildly virulent diphtheria organisms in their throats should be encouraged to go about vaccinating and thus rendering immune their fellows, and safeguarding them against severe attacks of the disease. The question of what to do with a person who was a persistent carrier was a very difficult one, but when there was an outbreak of clinical diphtheria, one must attempt to exclude from school and isolate, as far as possible, those who were found to be carrying the bacilli. When the outbreak had died down, one might be faced with four or five children who still proved to be carrying the disease. What should one do with them? Should they be allowed to go back to school? Certainly their virulence should be tested, and the child should not be kept away from school for a very long time simply because it had once proved to be carrying what was perhaps a non-virulent strain. He did not believe virulent strains turned into non-virulent, or vice versa, and he had found it safe to allow children carrying non-virulent organisms to return to school. Altogether, the question of control in diphtheria was a very difficult one, and it had certainly not yet been worked out.

The PRESIDENT said that after much anxious thought and consideration given to the subject, in conjunction with Dr. Brincker, during the past twelve months, the conviction was forced upon his mind that the verdict against " R. C.," the carrier in School F, was one of not proven. Conradi said carriers were deemed to be infective because they came from infected surroundings, and so " R. C." was deemed to be infective because she came from infected surroundings. But anyone who investigated the statistical probabilities, and considered from an epidemiological standpoint all the circumstances connected with " R. C.," apart altogether from any presuppositions based upon bacteriological hypothesis, would be driven to the conclusion that hers was not a clear case. Kirchner, Conradi, and others, had suggested that the existence of the bacillus-carrier condition was evidence that the bacilli had ceased to be infective; and if one approached " R. C.'s " history from this, rather than from the ordinary point of view, the facts must be deemed to be unconvincing. There seemed to him to be various considerations which made it necessary to review their position in regard to the whole question of chronic carriers. There were the following sets of facts. It was now transpiring that the general population was affected with the bacillus-carrying propensity to a far greater extent than was formerly supposed; then there was the further fact that "enrichment methods" had been discovered by which bacilli could, it was claimed, be demonstrated at least twice as often as by other methods.

There was, moreover, the fact that experts like Dr. Brincker, using all their skill and ability in dealing with these outbreaks, could not bring them to an end by the mere exclusion of bacillus carriers. It was further necessary to remember that there were various "strains" of bacilli, and there was the fact mentioned by Mr. Goadby, that bacteriologists now admitted the possibility that one strain of bacillus might be transformed into another. It was necessary to agree in the light of all these considerations with the view, expressed by Sir Shirley Murphy, Dr. Butler and Dr. Thomas, that the time had not yet arrived when it could be said that all the facts about diphtheria were clearly known.

Dr. J. T. C. NASH sent the following contribution : I propose to deal with one or two points only in connexion with the question of diphtheria in schools : (1) When a particular class or department suffers from recurrent attacks of diphtheria it is important, as I pointed out in my paper on "Scarlet Fever and Diphtheria from a Public Health Point of View,"[1] to include the teacher or teachers in the clinical and bacteriological investigations. I there related how an elementary school teacher—a visitor—had come under my observation as a diphtheria bacillus carrier, from whom I obtained a history that her infants' department had been in trouble with outbreaks of diphtheria for years in spite of long closure, frequent inspections, and swabbings of children, &c. The teacher had been suffering from a rhinitis for the same period, which had received much treatment, even from a specialist. It cleared up in a few weeks, after the administration of diphtheria antitoxin, a swab having revealed Klebs-Loeffler bacilli. Dr. Brincker mentions an interesting case of a class teacher at School E as a "carrier" without any clinical symptoms. This emphasizes the importance of not overlooking the teachers in connexion with school outbreaks. (2) Cases with enlarged tonsils and deep crypts are very prone to remain long infective. The bacilli lie deep and are untouched by antiseptic applications. In such cases I have found tonsillotomy the only resource before I could clear the throat of bacilli and discharge the patient. (3) Slight cases of nasal diphtheria are often the source of infection, and nasal inspection and swabbing are of equal importance with inspection and swabbing of throats. (4) Though as a rule *Staphylococcus aureus* appears to outgrow the diphtheria bacillus, I have known these organisms remain in intimate symbiotic relationship for days, as shown by throat swabbings. Schiotz's treatment is not a method I should feel justified in supporting except upon very strong evidence, and in any case I should be chary of spraying a large number of pyogenic organisms two or three times daily on to the mucous membranes of nose and throat. (5) The recrudescence of scarlet fever and diphtheria, or at any rate of infectivity, is well proved, and forms one of the problems so difficult to assess and anticipate. I have known infective properties recrudesce a year after an attack.

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[1] *Practitioner*, Special Number, January, 1909.

Dr. BRINCKER, in reply, thanked the members for the way they had received his paper, and in particular he thanked Sir Shirley Murphy for his criticisms and expressed regret for not referring to his later paper. In this paper, read before the Epidemiological Society in 1900, Sir Shirley Murphy somewhat modified his opinion in regard to the importance of school attendance as an influence on the age-incidence of diphtheria.[1] But the latest statistics published by Dr. Newsholme in the Local Government Report tended to confirm the relationship of school influence and diphtheria. He continued as follows: Dr. Hamer maintains that the case against R. C. is *not proven*. This contention commands our very earnest attention, and brings us to the inevitable and only conclusion possible—namely, that whilst the science of bacteriology is yet in its infancy it is dangerous to dogmatize. Assuming, therefore, that the bacillus of diphtheria is a *sine qua non* in producing infection, it may well be asked why R. C. had not caused diphtheria amongst the occupants of her dormitory before she did ; unless we assume that the *intermittency of infectivity*, or *germ latency*, can provide the explanation. But quite a new aspect now presents itself. Only a few nights ago in this very same room before the Pathological Section of this Society, Dr. Thiele and Dr. Embleton made public the results of their investigations. They claim that pathogenicity and virulence in regard to bacteria are questions of adjustment between the animal and the germ. It therefore seems difficult to believe that the bacillus of Klebs-Loeffler is *per se* the only factor in producing the clinical manifestations of the disease. Such divergent views are apt to influence our motives and objectives in the administrative control of infectious diseases ; but the administrator would be ill advised at this point to allow speculative theories to exert too great an influence on the course he is to pursue. The plan we have always adopted was to regard all suspects as guilty until proved to be innocent. In this connexion the orthodoxy of the Public Health Department of the London County Council has been ably set before you to-night by Dr. Butler and Dr. Thomas. Mr. K. Goadby has referred to a paper read by him before the Epidemiological Society in 1899. This paper, " The Utility of Bacteriological Examination in a Diphtheria Epidemic in a School,"[2] 1898-1899, is the very first in the available literature in which the bacteriological methods are used to detect carrier cases : I regret having made no reference to him in my paper. I concur in Dr. Savage's views on the subject of school closure. In my opinion it should only be resorted to upon rare occasions, and then only after other and more comprehensive measures, such, for instance, as are mentioned in my paper, have failed to arrest the spread of the disease. By closing down schools we cut off the only field of investigation at our disposal, and in my opinion such a course is tantamount to a confession of failure. At this point attention should be drawn to two recent German papers. In the

[1] " Seasonal Variations in Age-distribution of Deaths from certain Infectious Diseases," Sir Shirley F. Murphy, *Trans. Epid. Soc. Lond.*, 1899-1900, xix, p. 205.

[2] *Trans. Epid. Soc. Lond.*, 1899-1900, xix, pp. 87-116.

first, " On the Epidemiology and Means of Extermination of Diphtheria "[1] by Professor v. Drigalski, of Halle a/S., he shows how the incidence of diphtheria in Halle has been reduced by the very strictest exclusion of contacts and carrier cases. In the second paper, " Ueber Diphterie-bacillenträger in einem Kölner Schulbezirk,"[2] Dr. F. Schrammen shows that apparently no harm resulted from the retention of carrier cases in school. I note that Dr. Savage would welcome information as to the short striking distance of diphtheria. Although it is the practice in London schools to illustrate in diagrammatic form the relative positions of affected and suspected children in the class, it is very rare indeed to find a case confirming the short striking distance such as the one given under School E. The deduction is that diphtheria does not usually spread amongst those associated in class-rooms; cases usually appear in different class-rooms, or among children not apparently associated in the same class-room. Again, the lengthy period during which cases of diphtheria may recur in the same school or class, in spite of all precautions, is illustrated in the tables given in my paper in regard to Schools A and B. Dr. S. Davies still retains a secret respect for the bacillus of Hoffmann. Although Dr. Thiele states that he has succeeded in making the bacillus pathogenic to animals, he does not say that he has actually transformed it, morphologically and bio-chemically, into a typical Klebs-Loeffler bacillus. From an experience of many years I think we may safely neglect its presence. One of the chief objects of my paper was to direct your attention to the fact that a carrier case would not only not show, or discharge, Klebs-Loeffler bacilli over considerable periods of time, but that the same child may give both Hoffmann and a variety of strains of Klebs-Loeffler bacilli at the same time; and that of the latter class one colony would be virulent and the other non-virulent to animals. If, therefore, Hoffmann's bacillus is found on one occasion and Klebs-Loeffler on another, it does not follow that the one has in the intervening time been changed into the other : the only inference that should be drawn is that the bacillus of Klebs-Loeffler has not been found, or is for the time being not recoverable, from the throat or nose of the carrier. In this connexion I would draw your attention to Dr. Cartwright Wood's report on R. C. under School F.

I stated in my paper that diphtheria appears to adhere to the better housed and better cared for portion of a community. In this connexion I would draw your attention to the view held, namely, that diphtheria is associated with virgin and damp soils, especially when contaminated with organic matter, and is insufficiently drained. But whatever explanation is adopted, the general laws of epidemics, or such of them as are known, must be taken into consideration in dealing with any local outbreak. Communities have their cycles of immunity and epidemicity. During the last few years Woolwich, Greenwich and Lewisham, for example, have had an increased incidence per population of diphtheria. When the ascending wave of incidence

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[1] *Centralbl. f. Bakt.*, 1912, Abt. i, Ref. Bd. 55, No. 4-5, p. 119.

[2] *Centralbl. f. Bakt.*, 1913, Abt. vi, Bd. 67, p. 423.

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reaches the crest in any locality then may we expect a decline in diphtheria incidence and deaths.

Diphtheria has been more or less epidemic along the Baltic coast during the past two years: both Amsterdam and Berlin have suffered very severely from outbreaks of diphtheria, and at the present time Amsterdam is in the throes of an epidemic of scarlet fever. Although London as a whole has been remarkably free from diphtheria during the last six years, we may yet in the immediate future have to contend with a very great and increased incidence of diphtheria.

I do not hold with Dr. Davies that mild cases *per se* are more infectious. I am inclined to state the case in another way—namely, that mild cases have greater and better opportunities for distributing the contagion, and those opportunities are greater in proportion to the amount of discharge, that is, in proportion to the chronicity of the condition. Chronic carrier cases of the kind I have described fortunately are rare, or bacteriology as a means of prevention would be of little use. The French method of quarantine over prolonged periods will then be the order of the day. Dr. Davies need not despair; bacteriology as a means of diagnosis and an aid to prevention is still of the very greatest help to us, but I would urge him to extend this test to all contacts and suspicious cases, whether they be children under school age or not, or adults outside school supervision. Of an infected household the younger would as a general rule be the sufferers, the elder the carriers.

In conclusion, I wish to thank Sir Shirley Murphy, Dr. Hamer and Dr. Kerr for placing their writings at my disposal; Dr. Frederic Thomson for suggestions and reports on R. C. and E. M.; and Mr. Jemmett, of the Public Health Department of the London County Council, for his valuable assistance in compiling the statistical facts which I have been able to place before you to-night.

Section of Epidemiology and State Medicine.

February 28, 1913.

Dr. W. H. HAMER, President of the Section, in the Chair.

THE TITLE AND OBJECTS OF THE SECTION.

THE PRESIDENT submitted the following resolutions for the approval of the meeting :—

(1) That the Title of the Section be changed from the " Epidemiological Section " to " The Section of Epidemiology and State Medicine."

(2) That the objects of the Section be defined as follows: " For the Investigation of Epidemic and Endemic Diseases in respect of the circumstances and conditions which favour, prevent, or are otherwise associated with their occurrence, their persistence, or their variations in type or character."

The resolutions were carried unanimously.

MH—11

Measles.

By WILLIAM BUTLER, M.B.

MEASLES has maintained an epidemic uniformity of type which is traceable through many centuries. Plague and typhus, leprosy and tubercle, syphilis and that intimate epidemiological associate of measles, small-pox, have all from one cause or another undergone the most profound epidemiological changes. But measles, so far as one can judge, has undergone but little alteration in its epidemic and clinical features from the time when the Arabian physicians noted the natural and apparently permanent characters of the disease. It is a chastening thought that the epidemiologist may to-day study at first hand the natural behaviour of this ancient disease, with the knowledge that its main features have remained unaltered by art or science or the cosmic changes which the centuries have brought since first it was described.

The constant association, in the works of medical writers, of measles and small-pox rests, doubtless, less upon the literary tradition than upon the natural analogies of these diseases. "The measles have a great affinity with the small-pox."[1] "The measles have been considered by authors to have much resemblance to the small-pox, and I am of opinion they bear a striking resemblance in many of their phenomena."[2] The popular assertion that everyone must have measles was held to be true of small-pox, with an equal degree of probability, in those pre-vaccination days when small-pox ran its natural course.

The Arabian physician, Rhazes, in his treatise on the small-pox and measles, devotes what in the modern publication of the translated manuscript has become a chapter, to "the causes of the small-pox; and how it comes to pass that hardly anyone escapes the disease." This is the feature which naturally small-pox shares with measles, and which, with the possible exception of whooping-cough, is, to the same extent, true of no other disease. Unmodified by intentional interference or exceptional natural conditions, it is probably true not only that hardly anyone escapes these diseases, but that few survive childhood without having undergone what in effect is found to be a protective

[1] "Of the Measles," the Medical Works of Richard Mead, M.D. Lond., 1762.

[2] "Of the Epidemic Measles of 1808," by Dr. Ferguson, *Med. and Phys. Journ.*, Lond., 1809, p. 359.

attack. The differential diagnosis of the two diseases, which to this day are not infrequently mistaken the one for the other, had been elaborated by the Arabian physicians. The following descriptions quoted from Rhazes will be recognized as mainly accurate more than one thousand years after the observations were made.

"The small-pox and measles are preceded by an acute fever, with violent pain and heaviness of the head, redness of the face, cough, dryness of the tongue and saliva; the veins of the face are swollen and inflated; the saliva is thick and viscid; and there comes on an itching of the nose, sneezing, redness of the eyes, with itching and a flow of tears, and puffiness of the face. The breathing is impeded, and there is disturbance of the mind, vomiting, loss of appetite, and a feeling of heaviness in the whole body. When you see these symptoms, or part of them, the small-pox or the measles will certainly appear, and sometimes when they appear the fever is obstinate, and the disease is more violent and difficult to treat; and at other times when they appear the fever is diminished: the measles are less elevated than the small-pox "[1] (p. 127).

"Sometimes the small-pox sinks inwards and is so like the measles that it is afterwards said that the measles are turned into small-pox. The difference between the two I have found to be, that the measles are red, and appear only on the surface of the skin, without rising above it, while the small-pox consists of round eminences. When these eminences appear, fix your attention on them, and if you are in doubt as to the disease, do not express any opinion about it for a day or two; but when there are no eminences, you must not give as your opinion that the disease is the small-pox "[2] (p. 113).

". . . the inquietude, nausea and anxiety are more frequent in the measles than in the small-pox; while on the other hand, the pain in the back is more peculiar to the small-pox than to the measles "[3] (p. 34).

". . . The bowels are generally relaxed in the small-pox and measles towards their decline, and especially in the measles; for which reason, after these diseases have passed their crisis, everything must be avoided which opens the bowels, even if they should be confined "[4] (p. 67).

"The fever attending the small-pox is a continued fever, and for the most part attacks children. . . . The eruption generally appears on the third day from the beginning of the fever, but sometimes on the first or

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[1] Rhazes on "The Small-pox and Measles," The Sydenham Society, Lond., 1848.

[2] *Ibid.*   [3] *Ibid.*   [4] *Ibid.*

second day. One of the most favourable symptoms is the appearance of the eruption on the third day, or at the time when the fever is mild " [1] (p. 104).

The quotation may appropriately be concluded by the following, from which it may be seen how much the medicine of the tenth and of the twentieth centuries have in common.

" Modern physicians are accustomed to give to drink butter-milk from which the butter has been removed " [2] (p. 105).

THE UNIVERSAL EPIDEMICITY OF MEASLES.

I have referred to the popular assertion that everyone must have measles, but the truth of this may well be questioned, or if admitted, with Rhazes we may inquire, as he did of small-pox, into the cause of measles, and " how it comes to pass that hardly anyone escapes the disease."

First of all, then, is it true that hardly anyone escapes the disease? During a number of years I have made very careful inquiries into the history as regards previous attacks by measles of persons exposed intimately to the infection, and by continued observation have ascertained whether such persons subsequently contracted the disease. The results are set out in the subjoined table, and if the 14,000 persons observed may be taken as typical of their class, the answer, so far as this class of persons is concerned, is in the affirmative.

TABLE I.—WILLESDEN.

Table showing as a result of nearly 14,000 persons observed the proportion who at different age periods had already suffered from a previous attack of measles.

Ages	Number observed	Number previously suffered	Number not previously suffered	Percentage previously suffered	Percentage not previously suffered
0-4	1,956	164	1,792	8·4	91·6
4-5	451	135	316	29·9	70·1
5-6	327	155	172	47·4	52·6
6-7	351	248	103	70·7	29·3
7-8	497	372	125	74·8	25·2
8-9	514	426	88	82·9	17·1
9-10	530	462	68	87·2	12·8
10-15	2,100	1,899	201	90·4	9·6
15-	7,255	7,061	194	97·3	2·7
Total	13,981	10,922	3,059	78·1	21·9

[1] Rhazes on " The Small-pox and Measles," The Sydenham Society, Lond., 1848.
[2] *Ibid.*

Of the approximately 14,000 persons observed, no fewer than 78 per cent. at all ages had previously suffered an attack of measles. Analysed into age-groups, the results are yet more striking. Whereas of the age-group 0-4 it was ascertained that only 8·4 per cent. of the children had already undergone an attack of measles, no fewer than 97·3 per cent. of persons of the age-group 15 and upwards had previously suffered from the disease, while at each year of age between these age-groups the percentage with a history of previous attack rose steadily and rapidly. A check upon the accuracy of the history was afforded in the subsequent observation of the cases investigated. All of the 14,000 cases were persons living in the same house with actual cases of measles, and were as stated continued to be observed until the period had expired when they were liable to show evidence of having contracted the disease. The results of these observations are set out in Table II, p. 124.

From this table it will be seen that in the group of contacts at all ages stated not previously to have been attacked by measles, 66·1 per cent., as contrasted with only 0·7 per cent. in the group stated previously to have been attacked, developed the disease as a result of contact with the cases in their homes. The distribution of these cases according to age is exceedingly interesting, but before considering this the point to which I wish to draw attention is the confirmation which the figures furnish of the approximate accuracy of the history given as to previous attack. It is to be noted that the statement as to previous attack was recorded prior to the subsequent development or otherwise of the attack of measles resulting from contact with a case in the dwelling-house. If the 14,000 cases may be taken as a random sample of the population in England, they show that among persons who have attained the age of 15 and upwards only 2·7 per cent. have escaped attack by measles. For the class of persons investigated it is probable that this figure is characteristic. The work was carried out in connexion with public elementary schools in Willesden ; and Willesden, a suburban district of rapid and recent growth, drawing its population from all parts of the country, is probably, so far as its public elementary school class of population is concerned, quite as typical as any sample could be of this class of population throughout the country. It would be an error, however, to assume that, because all but 2½ per cent. of the public elementary school class of the population had undergone attack by measles before reaching the age of 15, therefore all classes in the community suffered to a like extent. The experience of several of our public schools and cadet training colleges in recent years, in fact,

suggests that among the more favoured classes of the community
measles is less a necessary experience in the earlier years of life than
is the case among the masses of the population.

TABLE II.—WILLESDEN.

*Table showing the incidence of measles upon persons definitely exposed to infection, distributed
according to age and history of previous attack.*

Contacts stated not previously to have suffered.

Age periods			Number of contacts in house		Number of contacts attacked		Percentage attacked
					1908-11		
0-6 months	...	...	174*	...	18*	...	10·2
6-12 ,,	...	...	209*	...	161	...	77·0
1-2 years ...	...	...	242†	...	204†	...	84·3†
2-3 ,, ...	...	...	248†	...	221†	...	89·1†
3-4 ,, ...	...	...	323†	...	291†	...	90·1†
0-4 ,, ...	...	...	*1,792*	...	*1,391*	...	*77·6*
4-5 ,, ...	...	...	316	...	263	...	83·2
5-6 ,, ...	...	...	172	...	124	...	72·1
6-7 ,, ...	...	...	103	...	67	...	65·0
7-8 ,, ...	...	...	125	...	65	...	52·0
8-9 ,, ...	...	...	88	...	39	...	44·3
9-10 ,, ...	...	...	68	...	29	...	42·6
10-15 ,, ...	...	...	201	...	37	...	18·4
15 years and upwards	...	194	...	8	...	4·1
Total	...	*3,059*	...	*2,023*	...	*66·1*

Contacts stated previously to have suffered.

0-6 months	...	...	1*	...	—	...	—
6-12 ,,	...	...	1*	...	—	...	—
1-2 years ...	...	...	6	...	2	...	33·3
2-3 ,, ...	...	...	15	...	1	...	6·7
3-4 ,, ...	...	...	32	...	7	...	21·9
0-4 ,, ...	...	...	*164*	...	*17*	...	*10·4*
4-5 ,, ...	...	...	135	...	14	...	10·4
5-6 ,, ...	...	..	155	...	6	...	3·9
6-7 ,, ...	...	...	248	...	4	...	1·6
7-8 ,, ...	...	...	372	...	8	...	2·2
8-9 ,, ...	...	...	426	...	10	...	2·3
9-10 ,, ...	...	...	462	...	3	...	0·6
10-15 ,, ...	...	...	1,899	...	10	...	0·5
15 years and upwards	...	7,061	...	4	...	0·1
Total	...	*10,922*	...	*76*	...	*0·7*

* 1909 and 1910-11 only.   † 1910 and 1911 only.

I am indebted to Dr. Tubb-Thomas, the Medical Officer of Health
of Wiltshire, for the following facts relating to the recent outbreak of
measles at Marlborough College. Of 632 boarders in the school, no

fewer than 190 between the ages of 13 and 17 were attacked. This incidence-rate of 30 per cent. at the ages of 13 to 17 has to be contrasted with an incidence-rate of 2·2 per cent. of the public elementary school class between the ages of 10 and 15 under conditions of direct exposure. There were, moreover, in the school no fewer than 217 boys, or 34·3 per cent. of all the boarders, who had not previously suffered an attack of measles. Among the public elementary school class at the age-period 10 to 15, only 9·6 per cent. were found not previously to have been attacked by measles. Most striking of all is the fact that, of the 217 boys between the ages of 13 and 17 who had not previously suffered, no fewer than 181, or 83·4 per cent., were attacked with the disease. This 83·4 per cent. contrasts with the 18·4 per cent. of the public elementary school class of children who had not previously suffered of the age-period 10-15, who, when exposed to infection, alone contracted the disease. Curiously, of the 415 boys who were stated previously to have suffered from measles, 9 were attacked for a second time. This gives an attack rate of about 2 per cent. as contrasted with an attack rate of 0·5 per cent. in the previously suffered public elementary school class of the age-period 10-15.

Table III.

Table showing an analysis of the attacks of measles in a Public School in Wiltshire, 1912.

Boys in school				Number		Number attacked		Percentage attacked
Total boarders...	...	...	...	632	...	190	...	30·0
Stated previously to have suffered		...		415	...	9	...	2·16
Stated previously not to have suffered		...		217	...	181	...	83·4

Table showing number attacked at each year of age.

Age					Number attacked
13	...	...	...	...	15
14	...	...	...	...	53
15	...	...	...	...	67
16	...	...	...	...	40
17	...	...	...	...	15
					—
			Total	...	190

The explanation of the contrast in the behaviour of the public school and public elementary school classes of children when exposed to infection of measles, I shall return to later. But it may be here stated that the more careful fostering and lesser gregariousness of the public school class at the more tender age-periods means lessened risk of exposure to infection, and the delayed attacks mean probably only delayed opportunity of becoming infected.

The facts so far as this country is concerned appear to be that by far the greater proportion of the population undergoes attack by measles in childhood, and that for the most part this attack confers immunity throughout life. Certain classes in the community, probably as a result of greater fostering, escape during childhood, and these when exposed are found to suffer a greater degree of incidence at higher age-periods. In public elementary schools measles is a disease of the infants' departments, the older children escaping anything like epidemic outbreaks. In this the senior departments of public elementary schools contrast with the experience of public schools. A curious feature of the figures in Table II is the apparent decline in susceptibility with each successive year of life in children aged over 5. In part this is doubtless due to the fact that as children grow older they acquire an increasing degree of immunity to attack, just as with increasing age they are more resistant to the disease when attacked by measles or whooping-cough, as shown in the lessened fatality rates at the higher ages. The figures in Table II are not compatible with the experience of measles outbreaks of the kind with which we are familiar in public schools; they are in extreme contrast with the accounts we have of epidemics occurring in isolated communities protected by their isolation for prolonged intervals from epidemic recurrences of the disease. The immunity apparently acquired by increasing years entirely disappears in these circumstances. The explanation of the rapid decline in susceptibility *pari passu* with increasing years, apparent in the table, is probably that it is only in small part due to increasing immunity conferred by age, and mainly to the fact that where the risks of exposure to infection are so great as is usually the case with measles, the persons who survive each year of life without attack are increasingly those naturally selected persons whose innate immunity to the disease is abnormally great.

Contrasted with a population such as that of the South Sea Islands or of the Faröe Islands, or even with the specially protected more favoured classes of this country, the persons who survive to 16 years of age, say, without attack are for the most part the naturally immune. They have run the gauntlet of infection with impunity, and when exposed afresh exhibit again the insusceptibility which has already served them and which accounts for their not having previously suffered. It is quite otherwise with those who attain to adult age without ever having been exposed to measles infection. They, when exposed for the first time, succumb to the disease irrespectively of

age. There is, in fact, no selective age-incidence to be observed in a community subject only at long intervals to outbreaks of measles. This suggests the further view that not age, *per se*, but the opportunity which it confers of acquiring an active immunity through exposure to attenuated or minor doses of infection brings about the changes in susceptibility exhibited in the table. But whatever be the explanation, the widest ranges both in natural and in acquired immunity are exhibited under identical conditions of exposure to infection in the population of the public elementary school class in this country directly as a result of distributing it according to its age constitution. Not the least remarkable of these variations is that to be observed during the first year of life. It will be observed that of 174 infants under 6 months of age in houses invaded by measles only eighteen or 10·2 per cent. failed of the disease, whereas of 209 between 6 and 12 months of age no fewer than 161 or 77 per cent. contracted the disease. To what is this congenital immunity which practically disappears after the first six months of life due? It is not limited to measles, though, owing to the high infectivity of this disease, it is most readily demonstrated by a differential analysis of the ages of measles contacts. I have endeavoured to ascertain whether it were correlated to breast-feeding, but the data were inconclusive. It is probable that the protection is a maternal derivative, but to whatever it be due it is worthy of further investigation. The insusceptibility of very young children to measles is not a new observation. Thus Holt[1] says: "Very young children do not readily contract measles, but all other children are extremely susceptible. The disease broke out in a cottage of the New York Infant Asylum, which was occupied by twenty-three children, nearly all of them being under 2 years old; only four escaped, all these being under 5 months old. . . . In the Nursery and Child's Hospital during the epidemic of 1892. . . . there were in the institution 113 children under 2 years old; of this number 78 per cent. took the disease; but although a number were exposed, not one child under six months old contracted measles." The intimate relationship of the immunity or otherwise of the infant to the degree of susceptibility of the mother is further shown by the fact that cases have been recorded in which, when the mother has herself been suffering from measles, the infant has been born with the rash, or has developed it within a few hours of birth. Dr. Ferguson, writing of an epidemic of measles occurring in 1808, remarks that "children who were sucking had the disease

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[1] "Diseases of Infancy and Childhood," New York, 1913.

less violent than those who were between 20 months and 3 years of age."[1] If only the condition on which the congenital immunity of infants depends could be sufficiently understood to enable it to be made permanent, one of the most important problems in preventive medicine would be solved. Although for practical purposes this immunity has disappeared in the second six months of life, it is still traceable, while the greatest susceptibility appears to be attained in the third and fourth years.

These figures, as I have said, are in contrast to what is found when measles breaks out in what may be described as virgin soil. The analogy to small-pox is maintained in a respect which could not have been known to the older observers. Measles, except in the case of isolated populations, is a disease of childhood, attacking during the first decade of life by far the greater number of persons living at that age-period. In this it resembles small-pox in its natural incidence upon a population in which the children are unprotected by the induced immunity of vaccination. When a population is protected by its isolation from contact with measles for a sufficient period to enable its members to attain maturity without having been exposed to infection, if the disease is introduced, it becomes epidemic no longer solely among the children, but attacks, apparently indiscriminately, persons of all ages. Small-pox, normally a disease of childhood, becomes a disease of adults who have outgrown their protection, as we have seen it in vaccination times. Measles, a children's disease when only the children are unprotected, becomes equally a disease of adults when the adult population has failed to acquire the immunity conferred by previous attack. The analogy is even closer when, among an unvaccinated community which has been protected from small-pox by its isolation, the disease breaks out; as Creighton[2] points out in respect of the colonies, " it is as much an affair of adults as of the children." Perhaps two of the best illustrations of the truth of this statement as regards measles are the outbreaks that have occurred among the isolated island populations of Fiji and Faröe.

Taking first the Faröe Islands. From the year 1781 to the year 1846, the inhabitants appear to have been entirely free from measles. In the latter year, however, an epidemic broke out, and within six months nearly 6,000 of the 7,782 inhabitants were affected with the

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[1] *Med. and Phys. Journ.*, xxi, Lond., 1809, p. 363.

[2] " History of Epidemics in Britain," 1894.

disease. Assuming that every inhabitant was exposed to infection, the attack-rate of 77 per cent. of persons at all ages is phenomenal. In Willesden, of 3,059 persons of all ages who had not previously·suffered from the disease, living in the same houses with cases of measles, 2,023, or 66 per cent., were attacked, as shown in the table above. It is not a little remarkable that in a number of scattered islands·when the disease broke out, it should exceed the incidence-rate observed among unprotected persons in England when brought into intimate exposure to infection. "It is a remarkable fact," says Dr. Panum,[1] "that of those now elderly people who in 1781 had had measles, not one individual was affected on the present occasion. Other aged persons who had not had measles during the epidemic of 1781 were as liable to the disorder on this occasion as were their juniors. Some young people, though perpetually exposed in the most complete manner to the contagion, never seemed capable of taking the disease."

The notorious outbreak in Fiji of 1875 appears to have been even more complete in the manner in which it attacked the whole of the inhabitants. In a contribution made to the Epidemiological Society in 1877 by Dr. William Squire, he says : " The epidemic only ceased when every person had been attacked." In three districts where a census had been taken before the epidemic, the loss since the introduction of measles was ascertained, and it was found that among a population of 12,014 there had occurred 3,349 deaths, a mortality equal to about 27 per cent. of the total population. Altogether, in about four months there occurred about 20,000 deaths, a loss estimated at from about a fourth to a fifth of the total native inhabitants. Dr. Squire adds : " The favourable progress of the early native cases negatives the idea of special proclivity. So during the worst of the epidemic, at places where the people, seized with fear, had abandoned their sick. . . . the fact of only one death occurring among a number of cases, treated in separate rooms with fair attention, is against any but a locally acquired intensity of the disease. . . . . All the innate dangers of the disease here revealed differ only in degree and not in kind from those which are so commonly guarded against among ourselves by simple nursing."

There are numerous other instances of the wholesale manner in which, among uncivilized peoples, inexperienced in the disease, measles has spread with overwhelming and disastrous effect. It is estimated that no fewer than 30,000[2] natives died of the disease during an

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[1] *British and Foreign Med. Chir. Rev.*, 1851, vii, p. 428.

[2] Hirsch, " Geographical and Historical Pathology," 1883, i, p. 167.

epidemic of measles in 1749 on the banks of the Amazon, whole tribes being stated to have perished. Similar experiences are recorded among the natives of Astoria, among the North American Indians, among the Hottentots, and the natives of Tasmania.

One fact clearly emerges from an examination of these outbreaks. Natural immunity to measles is an exceptional condition. Whether it exists in higher degree among peoples more or less continuously subject to its epidemic prevalence, is at least doubtful. Certain it is that after congenital immunity has disappeared, the main protection at all subsequent ages is conferred by the "salting" process of an attack of the disease itself. This appears for the most part to be permanent. That only 0·7 per cent. of nearly 11,000 persons of all ages who were stated already to have suffered the disease should fail upon intimate exposure to infection, is in striking contrast to the facts observed in the epidemics in Faröe and Fiji, and affords the strongest proof of the persistency of the immunity conferred by an attack of measles.

Such being the normal condition of susceptibility to the disease, it may well be asked whether it is worth while attempting to avoid a disease so clearly marked out as the common lot of man. Nothing, however, is more striking than the variability of the disease in respect of mortality. The most marked differences both of general and of case mortality from the disease have been recorded in different epidemics. Among 8,167 cases which came to knowledge in Willesden, only 107 or 1·3 per cent. figured in the death returns as having succumbed to the disease. Of 6,000 persons estimated to have been attacked in the Faröe Islands, 102 died, giving a case mortality-rate of 1·7 per cent. These rates are low, even for fatality rates at all ages. Dr. Charles Creighton[1] attaches considerable importance to what, upon apparently insufficient data, he considers to be an increased mortality from measles in vaccination times. In what he describes as "one of the earliest and most memorable inquiries in vital statistics in this country," that of Dr. Robert Watt, of Glasgow, into the "Relative Mortality of the Principal Diseases of Children" (Glasgow, 1813), he cites as a witness to the change in mortality the following statement of Watt: "Children who had survived small-pox were fortified by this ordeal, not merely as selected lives, but positively fortified, so that measles, when it assailed them in due time afterwards, was taken mildly or was 'modified,' *not one in a hundred cases proving fatal.* But now (1813), when so few children have been through the small-pox,

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[1] " History of Epidemics in Britain."

measles has become ten times more fatal to them, *although it could hardly be more common than it used to be."* Here we are concerned rather with the fact than with the interesting theory propounded, and it is certainly important to have recorded by a reputable statistician that the fatality-rate fiom measles a century ago varied between 1 and 10 per cent. Compared with some of the death-rates in several of the epidemics referred to above, where whole families and tribes are stated to have been decimated, these rates are of modest dimensions.

It is to be noted that nearly all fatality-rates from measles are necessarily subject to error, arising from the fact that not all the cases dying, more particularly from the pulmonary complications of the disease, are returned as deaths from measles. They appear in death returns as deaths from bronchitis or pneumonia, and whenever measles (and the same statement is true of whooping-cough) is epidemic the deaths ascribed to pulmonary affections invariably rise. Presumably this under-statement of the deaths due to measles is true of all outbreaks, except those occurring in institutions where the cases are under medical supervision throughout. It is probable that the deaths from measles are understated to a greater extent than those from whooping-cough. The evidences of measles disappear with the eruption, but those of whooping-cough obtrude themselves for weeks after the onset of the disease. This is doubtless in part the explanation of the following figures, which are an analysis of the returns of deaths from measles and whooping-cough in Willesden in respect of the period at which death occurred.

TABLE IV.—WILLESDEN.

Analysis of Deaths from Measles and Whooping-cough in relation to Period of Disease at which Death occurred.

MEASLES : Total deaths, 196.

Dying during first week		Dying during second week		Dying during third week		Dying during fourth week		Dying after fourth week	
Cases	Percentage of total	Cases	Percentage of total	Cases	Percentage of total	Cases	Percentage of total	Cases	Percentage of total
54	27·5	89	45·4	28	14·2	11	5·6	14	7·1

WHOOPING-COUGH : Total deaths, 187.

18	9·6	48	25·6	38	20·3	37	19·8	46	24·5

For the reasons stated then, it may be assumed that the case mortality is higher than appears in all except institutional returns. This does not, however, account for the marked difference in the fatality rates observed in institutions, and among the general population under what may be described as the normal epidemicity of the disease. It has frequently been noted that institutions suffer an exceptionally severe case-mortality. In the Hospice des Enfants assistés in Paris, the average case mortality during four years was no less than 44 per cent.[1] In institutions in America it has been observed to range from 15 to 35 per cent.[2] In a small outbreak in a Poor Law infirmary at Willesden, the case mortality reached the high figure of 46 per cent. In two large hospitals during the American Civil War the mortality amounted to 20 per cent. of the sick.[3]

These high fatality-rates can only be paralleled among civilized peoples by outbreaks occurring among troops under war conditions. During the siege of Paris in 1871, out of 215 cases of measles occurring among the troops, eighty-six or 40 per cent. died. Nearly one-fifth of the national army of Paraguay is stated to have been carried off during an epidemic of measles, not from the severity of the disease, but from want of shelter and proper food."[4] Almost invariably where these high mortality figures are recorded it is stated that they were due not necessarily to the severity in type of the disease. What may be described as control observations upon cases treated and cared for privately during disastrous epidemics have shown that among these cases there was no abnormal fatality. Exposure, unsuitable or insufficient food, lack of nursing or medical care, overcrowding or other unfavourable hygienic circumstances are the conditions cited apparently with good ground as explanatory of high and exceptional mortality from measles. In institutional outbreaks of high fatality there are two circumstances which probably are accountable under conditions otherwise hygienic for the abnormal mortality. These are, first, the exceptionally low resisting power of certain institutional inmates—notably the children in Poor Law infirmaries—and secondly, the selection of cases which institutional treatment frequently implies, more particularly in the case of hospitals to which are removed the more severe and less

[1] "Measles," Allbutt and Rolleston's "System of Medicine," 1906, ii, pt. i, p. 386.

[2] Holt, "Diseases of Infancy and Childhood," 4th ed., 1907, p. 990.

[3] Hirsch, "Handbook of Geographical and Historical Pathology," p. 168.

[4] *Ibid.*, loc. cit., p. 169.

favourable cases occurring under the worst home conditions. One circumstance, however, stands out above all others as influencing case mortality, and that is age-incidence. It seems clear that the younger the age at which a child is attacked the higher is the case mortality. Over 90 per cent. of the deaths occur in this country under five years of age, though it is probable that not half of the children who in the course of their lives will undergo attack have at this age-period suffered the disease. It is difficult to ascertain the normal fatality of the disease at each year of age, that observed in institutions being, as already stated, higher than occurs among the general population. The figures of the Hospice des Enfants assistés are as follows :—

TABLE V.—CASE-MORTALITY FROM MEASLES IN INSTITUTIONS.

Hospice des Enfants assistés.

0 to 6 months ...	...	...	...	...	23·7	per cent
6 ,, 12 months	...	...	...	...	57·8	,,
1 ,, 2 years ...	...	...	...	...	53·9	,,
2 ,, 3 ,, ...	...	...	...	...	27·7	,,
3 ,, 4 ,, ...	...	...	...	...	13·7	,,
4 ,, 5 ,, ...	...	...	...	...	6·2	,,
5 ,, 10 ,, ...	...	...	...	...	2·4	,,
10 ,, 21 ,, ...	...	...	...	...	0·0	,,

Holt[1] gives an analysis of 143 cases occurring in an institution as follows :—

6 to 12 months	...	...	...	...	33 per cent.
1 ,, 2 years ...	...	...	...	...	50 ,,
2 ,, 3 ,, ...	...	...	...	...	30 ,,
3 ,, 4 ,, ...	...	...	...	...	14 ,,
4 ,, 5 ,, ...	...	...	...	...	0 ,,

The following table shows the fatality-rates as ascertained at Aberdeen during twenty years in which compulsory notification had obtained, compared with similar rates as ascertained in Willesden among cases coming to knowledge as a result of school notification. The Willesden figures relating to 6,278 cases are much smaller than those of Aberdeen, where in the twenty years over 40,000 cases were notified.

This higher mortality at the lower ages is a fact which has long been recognized as of the utmost importance. As we have seen, the prospects of avoiding permanently attack by measles are at present, except for a very small proportion of the population, exceedingly remote ; but we have

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[1] "Diseases of Infancy and Childhood," 4th ed., 1907, p. 990.

also seen that for the more carefully nurtured classes it is possible to delay the age at which, in the ordinary course, exposure to infection takes place, and by so doing to reduce the mortality. What then are the main reasons of the spread of measles at the earlier ages among the masses of the population? The answer is undoubtedly to be found in the fact that the children of the less favoured classes commingle in larger numbers and at earlier ages than is the case with those whom measles attacks at a maturer age.

TABLE VI.

Comparative case-mortality of measles at ages in Aberdeen and Willesden.

Age-periods	ABERDEEN			WILLESDEN		
	Cases	Deaths	Case-mortality per cent.	Cases	Deaths	Case-mortality per cent.
0—	3,034 ...	426 ...	13·9 ...	322 ...	9 ...	2·8
1—	5,222 ...	526 ...	10·0 ..	579 ...	29 ...	5·0
2—	5,195 ...	178 ...	3·4 ...	670 ...	20 ...	3·0
3—	5,053 ...	82 ...	1·6 ...	756 ...	11 ...	1·5
0—4	*18,504* ...	*1,212* ...	*6·5* ...	*2,327* ...	*69* ...	*3·0*
4—	4,836 ...	43 ...	·9 ...	915 ...	2 ...	0·2
5 and upwards ...	*17,034* ...	*91* ...	*·5* ...	*3,036* ...	*10* ...	*0·3*
Total ...	40,374 ...	1,346 ...	3·3 ...	6,278 ...	81 ...	1·3

Sir Shirley Murphy[1] has shown how, in the last half of the nineteenth century, there has been a definite shifting of the age-incidence of measles mortality in London, and gives the following figures as evidence of a remarkable epidemiological phenomenon :—

TABLE VII.—MEASLES : DEATHS ALL AGES, 1,000.

Years	0—	1—	2—	3—	4—	5—	10—	15—	20+
1851-60 ...	162 ...	366 ...	219 ...	116 ...	62 ...	63 ...	5 ...	2 ...	5
1861-70 ...	183 ...	386 ...	216 ...	107 ...	53 ...	46 ...	4 ...	1 ...	4
1871-80 ...	213 ...	393 ...	184 ...	97 ...	50 ...	55 ...	3 ...	1 ...	4
1881-90 ...	197 ...	383 ...	187 ...	104 ...	59 ...	63 ...	3 ...	1 ...	3
1891-1900 ...	212 ...	409 ..	172 ...	98 ...	55 ...	48 ...	2 ...	1 ...	3
1901-1905 ...	226 ...	423 ...	170 ...	86 ...	50 ...	41 ...	2 ...	0 ...	2

Sir Shirley Murphy adds : " This shifting of measles mortality on to the first two years of life is, no doubt, the result of increased aggregation of population in London and increased opportunity of infection, the result of aggregation of children in schools ; for measles, in greater degree than scarlet fever or diphtheria, spreads in the home to the

[1] Annual Report.

children of pre-school age if the disease be introduced into the home by a school-attending child."

I found in Willesden, among the cases coming to knowledge directly or indirectly as a result of notifications from the public elementary schools, that over 70 per cent. were traceable to cases directly contracted in the Infants' Departments of these schools. As might be expected, having regard to the greater proportion of susceptible material, the younger the age at which children attended school the greater the proportion which was attacked by measles. In one year, for instance, I found that 40 per cent. of the scholars under four years of age enrolled in the public elementary schools contracted measles by school contact. Of those between 4 and 5, 23 per cent., and of those between 5 and 6, 11 per cent. were similarly attacked.

Delaying the age of commencing attendance at school would probably raise to a higher age the proportional incidence of measles, but even then not all the younger children would be protected from exposure to infection, since, assuming that delayed attendance at school were successful in warding off, in the case of the elder children in the family, attacks of measles to a later age, the full value of this would not be gained. For the children contracting the disease at school, as Sir Shirley Murphy points out, take it to their homes, and there infect all the members of the family who have not previously suffered, and thus a considerable proportion of very young children are affected. It is probably due to the fact that public school children in large measure undergo their attack at school where they are boarded and lodged, that the younger members of the families at home escape exposure to infection. Among this class of children the family risk from school-spread infection, is practically *nil*, except in those cases of misguided interference where the school is dismissed during the period when those already exposed to the infection are incubating the disease. This device for diffusing infection among the scattered families which focus in a public school is fortunately not so common an occurrence as to prevent those wide differences of age-incidence which are apparent in the classes of children compared.

So far as public elementary schools are concerned, efforts to stay the spread of measles by early exclusion and school closure, which are the methods at present available, are frequently attended with success if, under a properly organized system, they are put into prompt execution at the beginning of school outbreaks. Frequently by the closure of an infants' school upon the occurrence of a first case, or even of a first crop of

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cases, I have been able to ascertain that the resulting cases have occurred during the period of school closure, and that upon the re-opening of the school no further spread of the disease has occurred, notwithstanding that many susceptible children were thus protected from exposure to infection. It is improbable that by these measures more will be accomplished than a slight raising of the average age at which children contract the disease. But this will mean a reduced mortality, which is the first object to be aimed at, and seems not unattainable. The high mortality, of which examples have been given, which attends neglectful or mistaken and ignorant treatment is another remediable condition which is slowly being removed as a result of widespread effort directed to this end. It is hopeless to expect wholly to control by the methods of isolation a disease to which there is such universal and high suscepti-bility—a susceptibility which is shown to be persistent throughout life, unless immunity has been conferred by actual attack.

Measles is a disease of intense infectivity, rapidly diffusible through-out any unprotected community amidst which it appears. Like a fierce combustion it is quickly extinguished by the exhaustion of its consumable material. In the comparatively brief period of its infectiousness, it is akin to smallpox, varicella, and mumps, and in contrast to scarlet fever, diphtheria, and typhoid. These latter diseases are normally of low infectivity, diffusing themselves slowly, in so far as their manner of spread is limited to that of personal or contact infection, even sluggishly, but persistently through prolonged periods. In the gamut of duration of infectiousness they are intermediate in their range between the brief infective periods which characterize measles and small-pox, and the extended intervals during which the infection is active in such diseases as tubercle, leprosy and syphilis. But the comparatively brief period during which measles is actively infectious is compensated by the rapidity of its diffusion in its pre-eruptive and unrecognized stage. One con-dition, and one condition only, places any permanent barrier to its spread, and that is the protection conferred by immunity. The control of measles, so far as one can judge from a broad survey of the facts, is likely to be successfully effected when a vaccine has been discovered, analogous to the vaccine which where it has been efficiently used has banished small-pox. Until this has been done, it would seem that measles must play its time-honoured rôle and visit in continually recurring epidemics the successive generations of men, who in this natural but sacrificial manner acquire the protective immunity which enables the greater mass of the population to withstand the otherwise ever present presage of a pandemic disease.
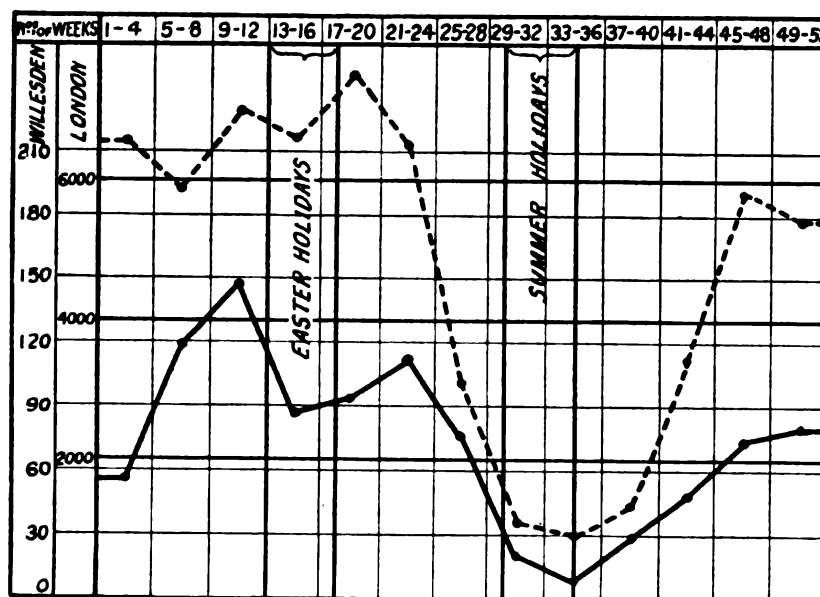
Average weekly number of cases of measles in London (continuous line) and
Willesden (dotted line), 1908-12.
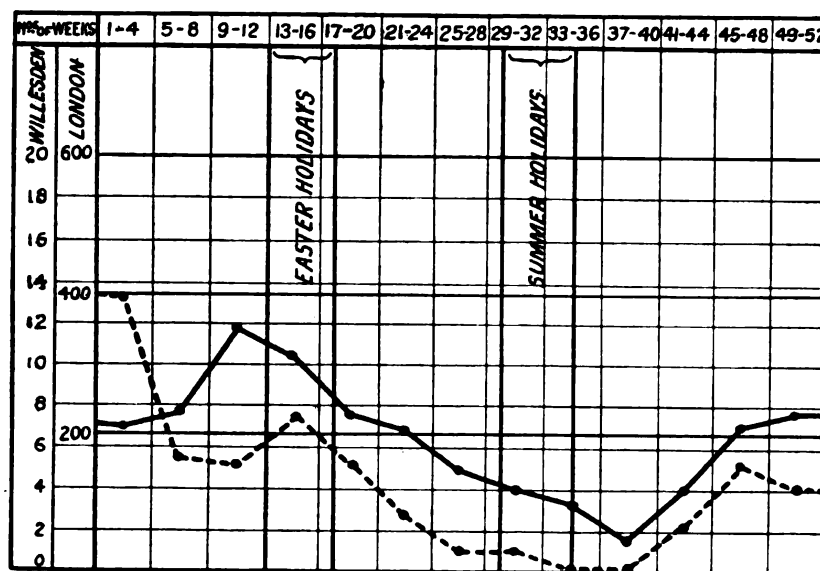
Average weekly deaths from measles in London (continuous line) and
Willesden (dotted line), 1908-12.

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A Note on an Epidemic of Measles at Rotumá, 1911.

By B. Glanvill Corney, I.S.O.

It is now just twenty-nine years since I had the honour to lay before the Epidemiological Society a record of the great measles epidemic which took place in the Fiji Islands in 1875.[1] What I am permitted to relate to you now records, I regret to say, a similar calamity which has but recently befallen the interesting native community inhabiting the little island of Rotumá, an outlying dependency of the colony I have just named. In the paper referred to, I mentioned that, as far as I could vouch without my notes before me, measles had not up to that time (1884) extended from Fiji to Rotumá, nor to other adjacent clusters of islands. Since then, Tonga has acquired it from New Zealand; and Fiji experienced a second but milder epidemic of it in 1907 from the same source, when the mortality amounted—using round numbers—to 1,800 out of 30,000 cases in a native population of about 89,000, who had had no contact with measles for thirty-two years. It is a fact, however, that Rotumá continued to escape infection until the early months of 1911, and it is to what has taken place at that island in this latter year that I now invite your attention for a few minutes only, because my statement will necessarily be confined to bare facts and a few figures, for a reason that will appear.

As Rotumá is but little known to the outside world, perhaps I may be excused if I offer a brief description of it and its geographical position. It is situated in latitude 12° 30′ S. and longitude 177° E., some 260 sea miles distant from the nearest part of the Fijian archipelago, from which it bears N.N.W. The most southern atolls of the Ellice Group lie about the same distance off in a north-easterly direction, and the nearest of the Samoan islands is Savaii, 600 miles E. ½ S. from it. It is of volcanic origin, being formed mainly of igneous rock and the products of its gradual weathering and disintegration, but is girt about all around at the sea-level with a fringing reef of coral. Its highest point reaches 840 ft. above the sea, and though no fewer than six ancient crateriform vents are recognizable, none of them have been active within the ken of local tradition or legend. The area of Rotumá is but 14 square miles,

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[1] *Trans. Epid. Soc. Lond.*, N.S., 1883-4, iii, pp. 76-95.

its total length is less than 9 miles, and its width varies from a stone's throw to 2 miles and 1,280 yards. In dealing with the land I am employing statute miles.

Although but a tiny spot upon the face of the waters, Rotumá is one of the most fertile and productive of South Sea islands; while, notwithstanding its remoteness and isolation, and in spite of Home Rule holding sway amongst them, its couple of thousand natives rank with the most prosperous, law-abiding, gentle and loyal subjects of the British Crown, under whose ægis and protection they came in 1880 by virtue of their own independent desire.

It was therefore a most unfortunate circumstance that, on January 29, 1911, a steamer called at the island with a case of measles on board. Whether it was definitely apparent, or as yet only in the incubative or pre-eruptive stage, I am not aware. The Government of the island is administered by a European Resident Commissioner ; and the Fijian Ordinance to regulate pratique and quarantine matters is not only in force at Rotumá, but there are special restrictive regulations made under it applicable to communication with this island. It is now some twelve or thirteen years since a recommendation I made that a medical officer should be selected for the position of Resident Commissioner was acted upon. But owing to the debilitating nature of the climate, which is not merely hot, but very humid, it is necessary to allow the Commissioner leave of absence at least once in every two years. This officer had proceeded on leave in the customary way towards the close of 1910 ; and the exigencies of the service in Fiji at that time made it impracticable to supply a medical deputy to act for him during his absence. So that, briefly stated, the infected steamer arrived at Rotumá at a moment when there was no medical officer on the island ; communications took place, and measles became implanted amongst the people. I am in a position to state positively that this disease had never previously visited Rotumá during the lifetime of the generations now living ; but the late paramount chief of the island, whose titular designation is Marafu, told Professor Stanley Gardiner[1] in 1897 that " when he was a boy measles ran though the whole island, and, he believed, carried off about one person in every house." Marafu remembered, too, to " have heard of an epidemic which followed the great Malhaha war, and was still more fatal." Whether Marafu really knew what measles, as differentiated

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[1] " The Natives of Rotumá," by J. Stanley Gardiner, B.A. Communicated by Professor Alexander Macalister, M.A., F.R.S., to the Anthropological Institute. Vide *Journal*, February and May, 1898.

from other zymotic diseases, means, is an open question, for it is within my personal knowledge that intelligent Fijians have sometimes used the term *misila* in reference to any widespread epidemic, such as influenza or dengue, since they learnt it in 1875. Marafu was an oldish man in 1897, and is not now living; it is reasonable to suppose that "when he was a boy" might refer to any time between 1830 and 1850. Peter Dillon, who was at Rotumá in 1827, described it as eminently thriving and populous, and mentions that "there were more than a dozen white men, deserters from whale ships, then living there, and all of them married two or three wives, according to the custom of the country, and had large families growing up."[1] Another voyager—Lucett I think—writes of as many as fifty-four white men being there about ten years later.[2] The Malhaha war occurred between 1800 and 1805, as nearly as can be fixed; and it is a significant fact that there is other evidence, both traditional and in print, of a very fatal and widespread epidemic of undetermined identity having prevailed in many of the Pacific island groups in 1802 or 1803 when whaling vessels and sandal-wood traders were beginning to become really numerous in those seas. That such was the case in Hawaii and in Fiji is certain; and there is reason to think that in the latter islands, where it was heralded by a parti-coloured three-tailed comet, and marked by an eclipse, the symptoms quoted in the native saga seem consistent with the idea that it may have been measles followed by ileo-colitis, as has happened since.

More than eighteen months have passed since I received, in private letters, news that my friends in Rotumá were in trouble. Measles had broken out there, during the medical Resident Commissioner's absence on leave, and the deaths due to it and its sequelæ were proving very numerous. A few further remarks of a general nature confirming this appeared in the Fijian newspapers, which may be seen in London at the Royal Colonial Institute. But it was not until December last that the Commissioner's Annual Medical Report for 1911 came to my hands. From it I cull the particulars, which, though dealing generally with vital statistics as an annual report should do, has in it some passages with special reference to measles. I may here explain that during the time I was Chief Medical Officer of Fiji a monthly medical report was rendered me by the Commissioner at Rotumá—a practice which I presume has been

[1] "Narrative . . . of a Voyage in the South Seas . . . , by the Chevalier Captain P. Dillon; London, 1829.

[2] "Rovings in the Pacific," by a merchant long resident at Tahiti; London, 1851.

continued to my successor; but those reports are not printed, and I have naturally not been in touch with them since my retirement from office, which dates from 1908. The population of Rotumá in my time fluctuated but little, and stood usually at about 2,200; but it is believed with reason that it was quite double that number in the first half of the last century, though I doubt whether it even reached 5,000, as an eminent missionary[1] has suggested.

I now proceed to quote from the Commissioner's (Dr. Hugh MacDonald's) Report[2] :—

"The estimated population of the island at the mid-year was 1,973 persons; and the actual number ascertained by a census taken on November 27 was 1,983.

"The births numbered 79, and the birth-rate, calculated on the number of people on November 27, only reached 39·8 *per mille*. This is a low rate for this place, where rates of 50, 52, 56 and even 59 *per mille* have been recorded. Of the total number, one was a stillbirth and five premature, and the cause of these was infection with measles on the part of the mothers. . . . The male births were seventeen in excess of the female, and numbered 48, the female only 31.

"The deaths numbered 489, and the death-rate reached the enormous figure of 246·5 *per mille*. The death-rate has always been high here, and in former years the lowest rate I have registered has been 37 *per mille* and the highest 54. A death-rate of 73 *per mille* was recorded in the year 1901, when Dr. Hall visited this place in connexion with an epidemic of choleraic diarrhœa [? ptomaine poisoning], which had prevailed for some time before his arrival. The explanation of the high death-rate this year is, of course, the epidemic of measles which, allowed to run through the people for the first time, during my absence on leave, swept them off literally in hundreds. The female deaths were 65 in excess of the male and numbered 277, as against 212.

"I have shown a return[3] of the age-period at which death occurred, and from it will be noticed that death has been most busy among young children, and adults from 20 to 25 years of age. From 5 to 20 years the incidence has not been so heavy, and over 45 years it has been comparatively slight.

[1] The late Mr. James Calvert.

[2] Legislative Council Paper No. 28, Fiji, 1912 (Annual Medical Report, 1911).

[3] Not printed with the original.

" The causes of deaths are shown on another return, and among the chief measles leads the way with its 326 victims.   The disease, as I have already reported, was in most cases complicated with ileo-colitis, most likely of bacillary origin ; in some with tubercular disease of the lungs ; in a few with yaws, pneumonia, pregnancy, childbirth, miscarriage. Phthisis pulmonalis follows next with 26 deaths.   Since the measles epidemic its prevalence has been widespread.   Always regrettably common here, it has become more so of late.   Acute broncho-pneumonia carried off twenty children—in most cases the disease might be put down as an after-result of measles.   I have put down twenty-three cases to ileo-colitis—following measles in all cases, but where complete recovery from the latter disease had taken place.   .   .   .

" Measles were introduced on January 29 when I was absent, and on my return on March 26, 700 cases were reported to me as existing. The epidemic continued throughout April and May, and finally died out in June.   It caused 50 deaths in March, 198 in April, 74 in May, and 4 in June.   It was accompanied with or followed by acute ileo-colitis —a very fatal complication in most cases.[1]

"Influenza appeared about the close of April, and continued its course through May.   It was unfortunate that it should have followed as close on the heels of the last-mentioned epidemic, as it must have undoubtedly proved fatal to many measles convalescents.

" Mumps were also prevalent in May, and the swellings in many cases disappeared very slowly ; it was not, however, very widespread."

The Report adds that owing to the epidemic of measles the progress of vaccination in the island was much interfered with ; and that, with regard to the future health of the people, an increase of tubercular disease, only to be expected, however, since the introduction of measles, should be noted.   This, Dr. MacDonald hoped, might perchance only weed out the undesirables and leave those best fitted to survive to propagate the race.

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[1] Cf. *supra.*

The following table represents the vital statistics of the community for the same year :—

TOTAL POPULATION.*

Estimated at the mid-year	1,973
Actual, by census on November 27	1,983

Births.

Males	48
Females	31
Total	79
Rate *per mille*	39·8
Stillbirth	1
Premature	5
Illegitimate	7
Births of mixed parentage	15

Deaths.

Males	212
Females	277
Total	489
Rate *per mille*	246·5

Marriages.

Total number	31
Rate *per mille*	15·6

* Including about a dozen Europeans.

The marriage-rate also was somewhat higher than has been customary, as a consequence of the measles epidemic: some of the survivors whom it bereaved having lost but little time in contracting new alliances.

DISCUSSION.

The PRESIDENT (Dr. W. H. Hamer) said the interesting papers just read had been written by two experienced epidemiologists. They were all familiar with the work of Dr. Butler, but he might perhaps remind them that Mr. Corney read papers before the Epidemiological Society as long ago as in the Session 1883-84, on "Epidemic Diseases in Fiji"; and, again, three or four years later, on "Epidemic Cerebrospinal Fever in Fiji." There were present members eminently capable of discussing the papers, including medical superintendents who had charge of institutions in which measles came under treatment, and also members qualified to discuss measles from the statistical side, such as Sir Shirley Murphy, Dr. C. J. Thomas, and Mr. Major Greenwood. Members had all been reading Mr. Greenwood's extremely interesting paper published in a recent number of the *Lancet*. They all felt chastened, and recognized with a sense of resignation that the conclusions of epidemiology, like the conclusions of every other branch of science, had to come under the review and criticism of the expert statistician. Mr. Greenwood was at the present time the only officially constituted appeal authority in this country, and members of the Section were proud to know that one of their number occupied a position in the modern world which could only be compared with that held by the Chief Priest of the Temple of Delphi in the ancient world of Greece. They all hoped the oracle would speak that night.

Sir SHIRLEY MURPHY said he would like to hear discussed the influence which could be effected upon epidemic measles by any step which might be taken by an education or health authority. He confessed his knowledge of the subject was limited to what he had read; and it had given him a rather hopeless view of the prospects of dealing with a rising epidemic of measles. He was sure Dr. Thomas, who had specially investigated the subject, must have something to tell.

Dr. C. J. THOMAS said he was not at all convinced that the elementary schools played such an evil part in measles as was generally attributed to them. It was difficult to conceive of a community of civilized people in which such schools did not form a part; and it would be an extraordinary thing if the way in which measles spread was not modified in some direction by the fact that children attended school; the majority of the children being in school the spread of measles must take place amongst them while in school. But this did not necessarily mean that the same children would not suffer if schools did not exist. Before dealing with some points arising out of Dr. Butler's paper, he wished first to express his satisfaction at hearing two such papers, one dealing with outbreaks in "the Hub of the Universe,"

and the other in one of the far outposts of the Empire. Measles being, perhaps, the most important disease we had to deal with, it was most desirable to arrive at a true appreciation as to the way in which the disease spread, and hence, what could be done to mitigate its effects. Measles was modified in big towns by the elementary schools in this way. Each child able to contract measles he would represent by a grain of gunpowder spread on a plane surface. In time these grains of powder would so approximate to each other that a light applied at one edge would ignite the whole train. This is what occurred in a community without schools. In a district in which school attendance was enforced, however, the conditions were different. During waking hours of every day this material was swept into little heaps, leaving spaces between, over which there was some difficulty in passing. Instead of having one sheet of flame of equal intensity, there were a progressive series of definite explosions. Heap after heap exploded, but there was a certain amount of resistance offered in passing from heap to heap, and occasionally a heap missed fire altogether. An advancing wave of measles passed thus from school to school in London. At the present time it took six months for measles to spread two miles in London. He did not think it could be said that the separate explosion method of spread of measles was worse than the other. A point of the utmost importance was that without the elementary schools one would lose the source of knowledge of cases of measles. That brought him to Table VI. Here Dr. Butler modestly said his numbers must be wrong. But how could they be wrong? They were the number notified in elementary schools, and the number of deaths among those notified in this way. Yet Aberdeen gave a mortality of 13.9 per cent. and 10 per cent. at two ages, whereas for the same periods of age Willesden gave 2.8 per cent. and 5 per cent. respectively. Optimist though he was, by race and temperament, he felt a pessimist in reference to ability to stamp out or arrest an epidemic of measles Still, by trying to mitigate the effects of it, and reduce the mortality from it, much could be accomplished. The knowledge with regard to individual cases which the elementary schools furnished would greatly help in bringing that about. Attempts to postpone the age of incidence by rough methods of school closure meant a gross interference with school work, with very small results ; at the best one could hope only for postponement for some five months or so. More was to be hoped for by following up notifications from the schools and giving advice to parents and others. A Medical Officer of Health in London sent a letter recently complaining that he had had notifications of cases of measles which were a month old, and he wanted to know if anything could be done to speed up notifications. Investigation showed that those cases arose in children who had been excluded on the appearance of the first case in their class of the disease, and they were notified on the return of the class to school, the earliest day that the attacks could become known. There had been no means of the Medical Officer getting knowledge of those cases, and so bring to bear his resources upon them. The success of the School Medical Officer

meant the failure of the Medical Officer of Health. Raising the age of school life had often been put forward as a means of postponing measles. If part of these islands could be taken as an experimental area, and children were not allowed to start school until 6 years of age, and in another part children were allowed at 3, probably some difference in incidence and mortality would be found if schools had really the effect sometimes ascribed to them. That experiment had, however, actually been carried out; for in Scotland the age of commencing school was higher than in England; in Aberdeen there was no modification of the severity of measles; children got measles at younger ages, and the mortality was as great at the younger ages as in the large towns of England. In the case of the diagrams with the peaks, he could not say Dr. Butler showed the cloven foot, but he certainly dropped a few feathers from his wings when he said he wished the lowering of the peak came after the holidays, instead of before. That table became clear as soon as one looked upon the schools as a steadying factor in measles, and the holidays as a disturbing factor. During school time, one had all, except 2 or 3 per cent. of children who could run about to any degree, under observation, and the striking area became notably limited, whereas during holidays they were scattered far and wide, and the same conditions obtained as if there were no schools. Moreover, at that time there was much visiting, and possible sources of infection were distributed to wider areas. Holidays extended the striking range, hence measles took a number of new holds on communities during the holidays. Then followed the steadying effect of schools limiting the range of infection, and before the end of the school term one began to see a sinking of the measles figures. Again it was interrupted by holidays, and up went the figures during the earlier part of the succeeding term.

Dr. SHRUBSALL asked whether Dr. Butler considered what was the importance from the standpoint of the individual child of the different mortality at different age-periods in school life? If one postponed the age at which measles came on, was one thereby materially increasing the chance of younger members of the family suffering from the disease, since with the lapse of time more children might have been born?

Mr. MAJOR GREENWOOD desired to raise one or two questions which he regarded as of considerable historical interest. The first concerned the history of measles in this country. The difficulty seemed to be that, although the description quoted by Dr. Butler from Rhazes showed clearly that the clinical features of measles might have been very similar in mediaeval times to now, yet he thought that morbilli certainly comprised other diseases than measles. This was seen if one attempted to trace the history of scarlet fever. It was known that one of the earliest recognizable descriptions of scarlet fever was due to Ingrassia, of Palermo, in the sixteenth century; but, if one looked at the large number of quotations from the Arabian school, given in Haeser's classical work, it was clear that a good many of the descriptions of morbilli given by

that school were, in all probability, anginal scarlet fever ; and it was usual in the passages quoted to regard morbilli as a more serious disease than variola. The most interesting point was whether such fraction of morbilli as corresponded to true measles consisted of a disease virulent to a degree comparable with experience of it when it attacked virgin soil now. The second point which he regarded as of historical interest was as to the passage which Dr. Butler quoted from Dr. Robert Watt. He (the speaker) thought the President's iconoclasm was tending to affect him, so that he was beginning to doubt whether Dr. Robert Watt's work was so extremely important a contribution to epidemiology as Dr. Creighton had said ; for Dr. Creighton described it as "one of the earliest and most memorable inquiries in vital statistics in this country." Of course, Dr. Creighton's reason attached great importance to Watt's view, since he (Dr. Creighton) regarded the decline of small-pox as an example of one disease being substituted for another. He (Mr. Greenwood) would be interested if other members of the Section had turned up Watt's paper. What Watt gave was the total number of burials classified by disease, and what he showed was, that the proportion of deaths from measles to the deaths from all causes had increased. So far as he had read Watt, he was not clear that he was talking about *fatality*, or that the fatality of measles was 10 per cent. and 1 per cent. in the different periods. He believed in the table it was that the ratio of deaths from measles to deaths from all causes was 10 per cent. in the last period and 1 per cent. in the first period. He did not see how Watt could get at the fatality, because he did not believe Watt knew the number of cases of measles. Dr. Creighton mentioned that Watt did not give the constitution of the population, and although it was probable that the absolute population was available, still it was certain that he had not got the population at different ages. As that was a period in which the effects of the industrial revolution were being felt, it could not be denied that the public health of Glasgow might, for all Dr. Watt said to the contrary, have been better at the end of that period than at the beginning ; it was a question of a disease being relatively more important, not necessarily absolutely more important. If one could show that the death-rate of one disease diminished faster than the general death-rate, it was obvious some other diseases must have increased relatively in importance. That did not seem to him to be a very epoch-making discovery. Watt's paper was referred to by Farr many years ago.[1] It was remarked that the rate of child mortality in Glasgow was extremely bad, even as late as the forties ; and Farr considered that the defects just mentioned did not invalidate Watt's induction that measles was substituting itself for small-pox, and offered an explanation, in which he admitted the principle of natural selection among organisms of disease. The interesting point was, how far this principle of substitution, which Dr. Creighton had made much of, was an important principle in epidemiology as it was known

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[1] "Vital Statistics," 1885, p. 321.

now. His last point was theoretical, and he merely wished to ask a question with regard to the diminished fatality of measles at the later ages.   He believed it was Dr. Whitelegge who, in a paper on scarlet fever, some years ago, pointed out the diminished fatality of that disease at the later ages, and suggested that isolation and measures to prevent spread led to a saving of life, because they warded off the disease until later years of life, when the fatality was less. Surely it was very important to decide between the alternatives indicated by Dr. Butler. Was it that the people who got measles later in life showed a lower case mortality because they had already survived small doses of the disease, natural vaccination, as it were, from the disease ? If so, supposing by some method, which was conceivable but not practicable, one could take a section of the child population, and absolutely shelter each child in that section from measles, when they got measles by exposure later in life, might the fatality not be as high as in the case of children at earlier ages who got it in the ordinary course ? In other words, was the lower fatality at later ages due simply to a weeding out, as it were, of susceptibles plus inoculation or vaccination of normals, or was it due simply to the increased physiological resistance which came with years ? He took it that an approximate solution of that problem was very important in determining whether delaying, if it was artificially done, was likely to produce the same effect as a delay which naturally occurred.

Dr. MILNE said he would like to give a short résumé of his personal experience with regard to measles, especially after the pessimistic views given on the subject of the control of measles. For over thirty years he had been deeply interested in the subject, and two years ago he read a paper before the same Section. The experience of the past two years most fully confirmed his position—that measles could be controlled and prevented. From many instances he gave the following : Two years ago, owing to neglect of precautions he insisted on, the cases of measles, in all, ran up to eighty in a community of 1,400 children. One of our best-known physicians, as well as a celebrated surgeon, together, visited the home where the outbreak was at its worst. The physician said that there ought to be an isolation hospital among so many children. He (Dr. Milne) pointed out to him that it was by far the worst outbreak that had occurred for twenty-seven years, when there were 144 cases among less than 500 children. When the disease increased so rapidly, two years ago, he kept 200 children from school; he specially visited all the cottages in which measles cases had occurred, twenty-three in number, to ascertain if the plan of treatment had been carried out. It had not. Printed directions were sent for every cottage mother, and a nurse set apart to have it carried out. The children returned on the same day to school. He assured the physician and surgeon that all would be over in less than three weeks after the treatment was fully carried out. This was actually so, except for two cases the following month. From what Dr. Bezly Thorne said at the debate on his paper two years ago, a most interesting test has been carried out. From two to four

drops of the best eucalyptus oil was given on sugar, according to age, to every boy in a home of 400 boys, of from 4 to 12 years of age. These boys attended four different public schools. In the vicinity measles had been very prevalent, and some of the schools closed on that account. The eucalyptus oil was thus given to prevent infection. It failed. A fresh arrival developed measles fourteen days after his admission to the home. Other cases, by the dates, were infected from the schools where many cases had occurred. Sixteen days ago he commenced giving the eucalyptus oil, as he formerly described, by inhalation, and which he had never found fail. To-day, when he visited the home, the Governor said " they were out of the wood." The only cause for anxiety was that pens and pencils were indiscriminately distributed, twice daily, in the schools these boys attended, and he wondered whether the eucalyptus oil would be sufficiently powerful to prevent infection from mouth to mouth. If not, then next week he would keep all the children from school, unless supplied with individual pen and pencil, carefully marked, and kept for the individual; then the full benefit would be realized. About three weeks ago he had a telephone message from the Governor of The Girls' Village Home stating that a service girl had been returned from Highgate in a motor ambulance suffering from measles, and asking what could be done with her? His reply was to ask the matron of the hospital to take her into an empty ward, and thoroughly rub her with eucalyptus oil, and treat her throat with 10 per cent. carbolic oil, then put her in the large ward where nineteen children were, and carry out the usual treatment. She was there all the time. There was neither infection nor complication. During the past two years at their seaside home at Felixstowe, where they had a most experienced matron, measles had appeared on three different occasions, amongst three different lots of children, and months apart. The different parties numbered from thirty to fifty. They were treated at once. There was neither spread nor complication. The medical attendant said, " It was most wonderful." Combined with the evidence given in the paper referred to, this proved that measles was as much under our control as scarlet fever.

Dr. E. W. GOODALL said he had listened to both the admirable papers with great interest. Measles appeared to be one of the diseases known to the ancients; but he was of opinion that some of the cases described by Rhazes as having been measles, which turned to small-pox, were really cases of small-pox with an initial morbilliform rash. Some years ago he had been desirous of ascertaining the number of cases of measles occurring in London, a point on which Dr. Butler had touched in speaking of the Willesden figures. Dr. Butler had the cases in schools notified to him, but he (Dr. Goodall) did not know to what extent this was done in London generally. It was of some importance for the body of which he was an officer—the Metropolitan Asylums Board— to have an idea as to the number of cases which were likely to occur in any given time and in any given locality. It was, however, very difficult to ascertain the number. The only long series of notifications he had been able to find in

the limited time he had to conduct a search into the question was the Aberdeen series for twenty years. In London, figures had been available only since school investigations had been carried on ; otherwise there were only the deaths to go by. Was one justified in assuming that the fatality, as shown by the Aberdeen figures for twenty years, could be applied to London ? He calculated that, if one took as a basis for the morbidity the average case-mortality which was exhibited in Aberdeen for those twenty years, then there must have been 100,000 cases of measles in London in the year 1906. In 1896 there were upwards of 3,600 fatal cases, and the total number of cases must have been very large indeed. The number of beds which would [have to be provided for the isolation of the bulk of measles cases in London during an epidemic would be appalling. Dr. Butler had shown how curiously epidemics varied from time to time. He was surprised no reference had been made to the epidemic which swept over London two years ago. It began in July, 1910, and culminated in the following March. He believed the number of deaths in one week in March, 1911, was 197, or about 130 above the corrected average. One would have gathered from the large number of deaths in the first quarter of 1911 that London was in for a record year of measles deaths in London. But the deaths fell short of those for 1896 by considerably over 1,000. Though there were 1,428 deaths in the first quarter of 1911 there were only 140 in the last. Recently another epidemic seemed to have commenced, judging by the number of cases now being admitted to hospital. He would like to hear whether there was any special reason why these epidemics should occur about every two and a half years. Did it not seem as if they were not much influenced by school attendance ? With regard to the case-mortality, only the worst cases were being sent to hospital. At present they were admitting only the Poor Law cases and the poorest of the class just above the Poor Law class ; hence the case-mortality was extremely high. For the year 1911 the case-mortality at the Eastern Hospital was 20 per cent., which was very high indeed for such a disease as measles. But for the year 1912, though the cases were drawn from the same classes as before, and though there were about the same number of cases (700), yet the case-mortality was 13 per cent. Whether an epidemic was particularly fatal at the same time that it was particularly infectious, he did not think had been worked out in regard to measles. He did not believe that those two factors necessarily went together, nor that one could assume the number of cases from the number of deaths. The statistics of the cases treated in the Asylums Board Hospitals bore out the statement that the younger the patient the more fatal was the disease. It was especially fatal in very young children. The principal cause of death in measles in London was broncho-pneumonia ; and, if the cases could be placed under treatment earlier, so as to ward off that complication, something definite would be done to decrease the mortality. He agreed that in a prophylactic vaccine would probably be found the most efficacious means of dealing with measles.

Sir SHIRLEY MURPHY asked if Dr. Butler could give information concerning the age-distribution of the first attacks in houses during the holiday period, and in the rest of the year, separately. If schools were productive of measles in any large degree, one would expect to find the age-period distribution of the first cases in houses during the holiday season quite different from that at other periods.

Dr. SANDILANDS said there was one question which seemed to him to be of importance—namely, the question as to the cause of death in measles. It had been said to be essentially broncho-pneumonia ; and he wanted to know what was the cause of the broncho-pneumonia which led to death. It was important to decide whether it was due to exposure to cold and draught through failure to keep the child in bed. Or was it due, on the other hand, to overcrowding and to closeness of the atmosphere in a stuffy, ill-ventilated tenement ? Until the matter was clear, it was difficult to know on what definitely to advise the mother, when one visited the home to point out the best course to pursue in the event of younger children being attacked. That led to the question whether one could really be satisfied that a single visit would produce, in an unsatisfactory home, conditions which would materially influence the chance of a child either surviving or dying. If there was no particular condition on which one could lay one's finger, if it merely came to the question of nursing, which could only be obtained in hospital, it seemed that, short of hospital treatment, a visit to the home was not likely to have any material influence. He would like to hear what Dr. Butler had to say on the essential causes of the mortality being higher among cases nursed at home than in those tended at hospitals. In many cases, the value of the advice to parents about calling in a doctor was discounted by the fact that medical men could be found who would prescribe for a child without seeing it, having accepted the mother's diagnosis. He was not satisfied that the commonly accepted theory which attributed the broncho-pneumonia of measles to "cold" was based on the results of scientific observations. The polluted air of an over-heated and over-crowded tenement might well be a more important cause of the same fatal complication. Or, again, the pneumonia might be due to an inevitable microbic invasion in debilitated subjects. In order to give effective advice, more precise knowledge was required as to the relative importance of these three possible factors in the production of death from measles.

Mr. CORNEY, in reply, said the paper he read was almost entirely historical rather than debateable, because the Medical Officer not being in the island when the outbreak occurred, the details were very scanty. The paper stated that death had occurred most frequently among young children, and among adults of 20 to 25 years. He had no figures dealing with the general incidence of the disease. In the Fiji epidemic of 1875 the incidence was practically universal ; almost every native in a population of 150,000 took the disease ; and the deaths were nearly 40,000 in four months. In the Fiji outbreak in 1904 there were

30,000 cases, limited largely to persons under 25 years of age, doubtless because the older inhabitants had been immunized by the previous visitation. There had been no case from 1884 to 1904. In Fiji the chief advice to natives was as to what not to do : copies were sent to all the headmen, who had the instructions read out to assemblies of the natives ; they were also printed in a native magazine and almanack. Many of the deaths were precipitated by the practice of sitting in the streams and pools, to get cool when they felt the fever on them, from which broncho-pneumonia resulted. But in the Rotumá outbreak most of the cases seemed to get ileo-colitis or dysentery, there being no streams or pools in that island. Naturally the discussion had been mostly concerned with the behaviour of measles in this country, but he was appreciative of the attention which had been accorded to his contribution.

Dr. BUTLER, in reply, desired first to thank Mr. Corney for his paper, and to express the hope that when the more detailed figures from the annual report came into Mr. Corney's possession, he would add them to his paper, so that they might be included in the *Proceedings* of the Society. He thought it very important that an outbreak of that kind should be placed on record as fully as possible, as such instances afforded valuable information of the manner in which measles acted upon a totally unprotected population. Another point of interest in Mr. Corney's paper was the extraordinary high mortality in that year from phthisis pulmonalis—namely, twenty-six deaths in a population of under 2,000, which was ten times the rate in London, and occurring, moreover, in a population living not under urban conditions and in a climate which was supposed to be favourable to protection from tubercle.

He thanked members of the Section for the manner in which they had received his own paper. He could not complain of undue criticism. Even Dr. Thomas found it necessary to play the part of *advocatus diaboli*, and had felt impelled to overstate his case. Dr. Thomas was much more sanguine about the means at the disposal of the profession for controlling measles than he himself was. While he (the speaker) had had to modify his attitude as to the part played by schools in diffusing the disease, Dr. Thomas concluded that the schools were positively a means of throttling the disease. He did not think the depression in the curve shown in the diagram which occurred during the holiday period had anything to do with the fact that it had been throttled during the time of school attendance, and the curves did not bear that suggestion. It was very difficult to conceive how any means at present available could have that effect. The seasonal curve of measles did not apparently bear any relationship to attendance at school. It might be that it would be longer drawn out, that it would be a flash along a straight line rather than a hump if the children were not aggregated to the extent now obtaining. But one always got, during the middle part of the year, the lowest incidence from this disease, an incidence which he could not believe would be modified even if one did away with school attendance altogether. But there

was no doubt that measles was spread in schools. Experimentally that could be demonstrated, for by closing the schools the cases fell during the period of non-attendance, and one could re-open after such a period and the schools remained free. If the children attending those schools were unprotected by previous attacks of measles, one would otherwise have had the whole of the school children attacked. It was possible, by preventing contact, to protect children from the incidence of measles at the earlier ages, as shown by the experience of the public schools. The outbreak at Osborne could not be paralleled in any public elementary school in London. One could not get among boys of 13 years of age and over, an outbreak of measles such as frequently occurred in public schools. One could have measles introduced into the senior departments of public elementary schools without disturbing them much, because the children were already protected. But at Marlborough, and other public schools, when a disease broke out, down the boys went. They were a class in the community which had been protected by not being brought into contact with the disease. And that brought him to Mr. Major Greenwood's point as to the diminished fatality at later ages being possibly due to acquired resistance owing to a species of natural vaccination by small or attenuated doses of the virus. Against such explanation was the fact that one found that the fatality rate was uniformly low in all the experiments at the higher ages. The elder children in a family who took measles in the public elementary schools at 5 years of age had a low fatality-rate, although their younger brothers and sisters at home died at a higher rate. It was not that they had been protected by attenuated doses, because they went to school for the first time at 5 years of age, and 80 per cent. took the disease at this period of maximum susceptibility, though only a small proportion died. One did not find a high fatality-rate among public-school boys who presumably had not been protected by the attenuated dose. The natural vaccination against measles, if it operated at all, operated in protecting against attack rather than fatality, and accounted for the diminishing number of persons who with advancing years showed a susceptibility to measles. The cause of the measles fatality was the pulmonary complication, and that was the answer to Dr. Sandilands's question as to what advice should be given to the mother. It was a question of hygiene. Where one could anticipate an outbreak of measles in a household, it was possible to maintain a low fatality, even among the younger children, by insisting on the observance of the elementary rules of hygiene. Above all, the children must be kept warm; exposure to cold precipitated pulmonary complications; the rooms should be well ventilated, and the children warmly clad. In reply to Sir Shirley Murphy, he regretted he had not got a table showing the age-distribution of first attacks during holidays in houses, and he feared his data would not enable him to construct such a table. What struck him about his figures was that, assuming the fatality-rate was the same among the cases which did not come to knowledge as among those which did, there must have been during several years over 3,000 cases a year in Willesden,

where the births numbered 4,000 per annum—i.e., a number equal to three-fourths of the births.   He did not think there were as many as that number. He thought the case-fatality was greater among those who did not come to knowledge.   He agreed with Dr. Thomas as to the importance of the schools in enabling one to know what houses were attacked by the disease, so that due measures could be taken.   It had been interesting to him to hear the discussion on a disease with which most households made acquaintance, by reason of its wide prevalence, and which appeared to remain unmodified by all the measures which had been taken.   For that reason it had a pre-eminent claim on the attention of epidemiologists.

Section of Epidemiology and State Medicine.

April 4, 1913.

Dr. W. H. Hamer, President of the Section, in the Chair.

The House as a Contributory Factor in the Death-rate.

By A. K. Chalmers, M.D.

The influence of the house on the health of its inmates is no new theme. It has frequently been discussed in relation to surface density, (the number of houses or persons on a limited area), and in relation to the cubic space within the dwelling. I propose to-night to ask your attention to it from the point of view of the age of its inhabitants.

At the 1901 census I had an opportunity of comparing the death-rates obtaining in our Glasgow population among the inmates of houses of several sizes—i.e., according to whether they occupied one, two, three, or four and more rooms, and what seemed to demand an explanation was the very considerable interval which separated the rate obtaining among the occupants of the one-roomed house from those occupying two apartments, but more especially from those occupying three apartments and upwards. For example, among the one-apartment population, which numbered over 100,000 persons, the death-rate approached 33 per 1,000; the two-apartment population approached 350,000 and had a death-rate of 21 per 1,000; in nearly 152,000 persons occupying three-apartment houses the death-rate was under 14 per 1,000; while in over 136,000 persons occupying houses of four apartments and upwards it was only 11 per 1,000.

The difference between the extremes was so great as to suggest a discrepancy in the units compared, but lack of information regarding the age-distribution of the several populations made it impossible to carry the comparison beyond a simple statement of the relative prevalence of certain groups of disease among them. It was thus possible to show for the zymotic group (as then understood), for phthisis, and for the other diseases of respiration separately, that the rate followed the

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direction of the general death-rate—in other words, that the death-rate increased as the size of house diminished.

The element which was lacking in the 1901 inquiry I have now been able to obtain from the 1911 census, and the first scrutiny of the age-distribution suggested that a very considerable portion of the differences in the death-rate could be ascribed to the larger proportion of children in the smaller houses.   It showed, for example, that while 11 per cent. of the total population consisted of children under 5 years, in the one-apartment population they formed almost 19 per cent., and in the two-apartment almost 14 per cent. ; while in houses of three and four apartments and upwards the proportions were 7 and 4 per cent. respectively. A further point of importance emerged when the deaths were cast for these several groups of the population in the disclosure that even when corrected for age-distribution the death-rate of the population occupying four apartments and upwards was slightly under 12 per 1,000 (in a population of over 160,000), a quite unlikely, if not indeed a wholly impossible, rate in any mixed population living under existing conditions.   Both together inevitably raised the question whether it was possible to get any nearer the true significance of the relationship between house-room and death-rate, and I propose submitting for your consideration some features of the analysis which was undertaken in the endeavour to throw light on this question.

Few words are necessary to indicate the volume of the material employed.   The census population (784,496) was taken as the central population of a period of three years, and the deaths were those occurring throughout a period of eighteen months on each side of the census date.   The total deaths exceeded 39,000, and the aggregate population during the period exceeded 2,350,000.   The age- and sex-distribution of the population occupying houses of the several sizes I have mentioned had been extracted for local purposes,[1] the ages being in twelve age-groups and the occupants of all houses of four apartments and upwards being taken together.   The deaths were now similarly distributed, save in the first instance, those occurring in institutions and having no home address to which they could be allocated.   To this I shall return.

Having reached this point, we were in a position to ask whether a comparison with the corresponding rates for 1901 afforded any information regarding the distribution of the reduction of the general

[1] Census Report, 1911. Glasgow and its Municipal Wards. By the Medical Officer of Health.

death-rate which had characterized the period generally. In 1901 the death-rate for the city as a whole and for all ages and both sexes was 20·6 per 1,000; in 1911 it was 16·6, a reduction of over 19 per cent. Could it be demonstrated that this reduction had been shared in equal degrees by all sections of the population? Subject to explanation afterwards I introduce the following table :—

REDUCTION IN DEATH-RATE DURING THE DECADE ACCORDING TO SIZE OF HOUSE.

Death-rate from all causes in houses of several sizes.

	Census population		Deaths		Death-rate		
	1901	1911	1901	1909-12*	1901	1909-12	Per cent. decrease
1 apartment	104,128	104,641	3,405	8,161	32·7	25·9	20·8
2 apartments... ...	348,731	867,341	7,418	18,287	21·3	16·5	22·5
3 apartments... ...	151,754	160,083	2,081	5,515	13·7	11·5	16·0
4 apartments and upwards	136,511	127,549	1,533	4,119	11·2	10·8	3·6
Institutions and harbour	20,588	24,882	1,072	2,942	52·3	39·3	24·9
Not traced	—	—	207	—	—	—	—
City	761,712	784,496	15,716	39,024	20·6	16·6	19·4

* Fourth quarter, 1909; first three quarters, 1912.

What significance are we to attach to this reduction in the general death-rate by almost one-fifth in ten years? Before considering this, certain changes in the age-distribution of the population are to be noted. Between 1901 and 1911 the population of Glasgow increased by barely 9,000,[1] but the increases were confined to age-periods over 35 years, save at ages 10 to 15 in males and 5 to 15 in females. In both the increase was purely nominal (0·1 and 0·69 per cent.), while of greater importance is the reduction at ages under 5, which in number amounted to 4,752, and represented a reduction of 5 per cent. on the 1901 population at these ages. In relation, however, to the total population this reduction was only about ⅔ per cent., and as during the last twenty-five years the death-rate of children under 5 has fallen from 86[2] to

[1] Within the area as at 1911.

[2] A new Life Table for Glasgow, based on the mortality of the ten years, 1881-90, by A. K. Chalmers, M.D., D.P.H.

60 per 1,000 for boys and from 76 to 49 for girls, there is ground for regarding the decline in the death-rate of the last decennium as resulting to a considerable extent from a reduction in the rate among the inhabitants of the smaller-sized houses.   This view is, I think, supported by the even greater decline in the death-rate of the institutional group, for, as we shall see, there are certain anomalies in the rates for the higher ages in small houses which arise, I think, from a drift of the sick and infirm among their population in the direction of institutions in later life.

In his address as President of the Preventive Medicine Section of the York Congress of the Royal Sanitary Institute, Sir Shirley Murphy approached this question of the incidence of the decline in the death-rate on the basis of the proportion of children of school age attending elementary schools, and regarded the evidence as suggesting not only that the decline in the death-rate in the total population might in part be related to improved environment, but that it was progressing more rapidly among the lower social grades.   The preceding table shows a reduction which amounts to over 22 per cent. in our two-apartment houses, but falls to less than four in houses of four apartments and upwards.   Our birth-rate fell by fully 12 per cent. during the decade, but the difference in the proportion of children under 5 in the two periods was less than 1 per cent., and difference in age-distribution alone will not account for the decrease.

Age- and Sex-distribution.

Meanwhile, in order to disintegrate the effect of age and sex, I insert the death-rates for males and females arranged in age-periods and grouped according to the size of house occupied.

Here the sexes, taken separately, maintain the features of their combined death-rate in relation to the size of house.   Females at all ages have a rate of 25 per 1,000 in one-apartment houses; 16 in two-apartment houses; 11 in three-apartment houses; 9 in houses of four apartments and upwards; and 45 in institutions.   For males the corresponding rates are 27, 17, 12, 13, and 37.

At each age-period also, as a rule, the death-rate is lower as the house increases in size, the main differences being at the later ages when, as I have suggested, the drift to institutions has become established.   The exceptions otherwise have usually an obvious explanation. For example, the rate for males at ages 35 to 45 in four-apartment

1909-1912.—DEATH-RATE FROM ALL CAUSES AT SEVERAL AGE-PERIODS IN HOUSES OF SEVERAL SIZES.

Males, per 1,000 living.

Size of house in rooms	Ages												All ages
	−1	−5	−10	−15	−20	−25	−35	−45	−55	−65	−75	+75	
1 apartment ...	210·25	40·56	6·97	4·54	4·82	5·24	5·11	12·55	29·18	41·17	85·11	105·90	27·26
2 apartments ...	168·88	30·20	5·56	3·16	3·94	5·40	5·42	9·01	19·30	39·69	76·12	158·07	17·07
3 apartments ...	128·25	17·94	3·49	2·18	3·14	3·81	4·90	7·61	14·63	29·49	64·15	146·07	11·96
4 apartments and upwards	102·57	10·27	3·47	1·80	2·71	2·97	3·92	8·50	14·49	27·79	67·47	157·12	12·89
All houses	169·29	29·67	5·20	2·90	3·56	4·44	5·03	9·12	18·16	34·06	71·90	147·36	16·71
Institutions and shipping...	374·07	51·95	13·13	5·74	6·40	7·67	13·10	21·50	32·97	67·25	119·87	234·45	36·71
City	171·29	30·01	5·82	2·94	3·62	4·59	5·44	9·94	19·34	37·21	77·54	157·07	17·61

Females, per 1,000 living.

Size of house in rooms	−1	−5	−10	−15	−20	−25	−35	−45	−55	−65	−75	+75	All ages
1 apartment ...	163·64	37·47	6·92	4·46	5·61	5·89	7·37	14·86	26·84	37·28	61·09	83·85	24·90
2 apartments ...	123·31	26·75	5·18	3·14	3·95	5·57	6·50	9·75	18·39	35·36	67·48	125·03	16·12
3 apartments ...	101·07	14·80	4·04	2·33	2·87	3·40	4·32	6·93	10·17	24·99	54·46	147·48	11·02
4 apartments and upwards	72·95	9·87	3·10	1·45	1·64	1·86	2·58	4·90	8·03	17·89	40·01	145·26	9·19
All houses	129·14	26·48	5·04	2·86	3·29	4·15	5·47	8·86	14·75	28·48	56·46	127·06	15·03
Institutions and shipping	365·45	51·65	9·55	8·37	12·43	7·72	10·05	32·33	48·51	82·61	159·73	213·98	45·47
City	131·26	26·77	5·10	2·95	3·44	4·25	5·57	9·20	15·31	29·77	60·68	133·51	15·61

houses exceeds that of three apartments, but digestive diseases are more prevalent, and phthisis reaches its maximum incidence in them. Phthisis also explains the higher rate in two-apartment males at ages 20 to 25.

Male v. Female Rate.—At the several age-periods also the male rate usually exceeds the female, the exceptions, however, being of some importance. In one-apartment houses the female rate exceeds the male at ages 15 to 45, and in two-apartment houses at ages 20 to 45. Puerperal fever and septic diseases prevail among females at these ages, while phthisis contributes partly to the excess at ages 25 to 45. In three-apartment houses the excess is confined to ages 5 to 15, when the female phthisis-rate exceeds that of males. Generally, therefore, the analysis, I think, warrants the suggestion that the variations in the death-rate at all ages associated with houses differing in size are not to be explained by simple differences in age and sex constitution.

The Death-rate as tested by a Standard Population.

But in order to get rid of the discrepancies arising from differences in age-distribution and to get all four groups of population on a fairly comparable basis, I have adopted the test of a standard population with the age and sex distribution of the whole city, and applied to the several age-groups constituting it the death-rate ascertained to exist at corresponding ages in the various sized houses. Calculated in this way, the differences become more intelligible. In 100,000 persons with the age and sex distribution of the whole population, the following differences emerge in association with the varying size of house.

CALCULATED DEATHS OCCURRING AMONG 48,605 MALES IN ONE, TWO, THREE AND FOUR APARTMENTS AND UPWARDS, AND IN INSTITUTIONS AND SHIPPING.

Ages	Size of house in rooms				Institutions and shipping
	1	2	3	4 and upwards	
— 1	247	193	151	121	440
— 5	180	134	80	46	231
— 10	36	29	18	18	68
— 15	22	15	11	9	28
— 20	23	18	15	13	30
— 25	24	24	17	13	34
— 35	43	45	41	33	109
— 45	83	60	50	56	142
— 55	134	89	67	67	151
— 65	86	109	81	76	185
— 75	106	95	80	84	150
75 +	29	43	39	42	63
Total	1,013	854	650	578	1,631

CALCULATED NUMBER OF DEATHS OCCURRING AMONG 51,395 FEMALES IN ONE, TWO, THREE AND FOUR APARTMENTS AND UPWARDS.

Ages	Size of house in rooms				Institutions and shipping
	1	2	3	4 and upwards	
— 1 ...	192 ...	145 ...	119 ...	86 ...	429
— 5 ...	166 ...	119 ...	66 ...	44 ...	229
— 10 ...	36 ...	27 ...	21 ...	16 ...	50
— 15 ...	22 ...	15 ...	11 ...	7 ...	41
— 20 ...	28 ...	19 ...	14 ...	8 ...	61
— 25 ...	30 ...	28 ...	17 ...	9 ...	39
— 35 ...	37 ...	33 ...	22 ...	13 ...	90
— 45 ...	99 ...	65 ...	46 ...	33 ...	215
— 55 ...	130 ...	89 ...	49 ...	39 ...	235
— 65 ...	111 ...	106 ...	75 ..	53 ..	247
— 75 ...	105 ...	116 ...	94 ...	69 ...	276
75+ ...	45 ...	67 ...	79 ...	77 ...	114
Total ...	1,001 ...	829 ...	613 ..	454 ...	2,026

We can now place the several groups on an approximately uniform basis with the following results :—

CALCULATED DEATHS.

Population	One apartment	Two apartments	Three apartments	Four apartments and upwards	Institutions and shipping	All ages
Males— 48,605 ...	1,013 ...	854 ...	650 ...	578 ...	1,631 ...	—
Females—51,395 ...	1,001 ...	829 ...	613 ...	454 ...	2,026 ...	—
Calculated death-rate per 1,000 ...	20·14 ...	16·83 ...	12·63 ...	10·32 ...	36·57 ...	—
Observed death-rate						
Males	27·3 ...	17·0 ...	11·9 ...	12·9 ...	36·7 ...	17·6
Females ...	24·9 ...	16·1 ...	11·0 ...	9·2 ...	45·5 ...	15·6
Both sexes ...	25·9 ...	16·5 ...	11·5 ...	10·8 ...	39·3 ...	16·6

It will be observed that the rates for the two, three, and four-apartment houses are little altered in the above arrangement. The one apartment rate, however, is reduced by 22 per cent., and the rate for institutions by nearly 8 per cent. Even so, however, a population of 100,000 with the age and sex distribution here assumed would, with the rates obtaining in one-apartment houses, yield 2,014 deaths annually ; in two-apartment houses, 1,683 deaths ; in three-apartment houses, 1,263 deaths ; and in houses of four apartments and upwards, only 1,032 ; while in institutions they would number 3,657. These are substantial differences, and indicate very fairly, I think, the varying degrees of resistance to fatal disease presented by the several groups of populations we are considering. In this relative sense I believe them to be strictly comparable ; but at the same time none of them are, I believe, to be regarded as absolute rates, if for no other

reason than that in a stationary population, even the one-apartment rate would imply an expectation of life at birth of 49 years, or nearly five years more than the corresponding expectation for males in England and Wales, and only something less than four years below the expectation in the selected healthy districts according to the last English Life Table (1891-1900). I am disposed, however, to think that the one-apartment death-rate is understated, for you will observe that contrary to the almost uniform decrease in the number of deaths at each age as we go from one to four apartments, the *male* deaths in two-apartment houses at the ages 25-35 and 35-65, and the female deaths at ages 65-75, exceed in number these in one-apartment houses ; while at ages 75 + in both sexes the one-apartment population has fewer deaths than any of the larger-sized houses. And the institutional rate, composed as it is very largely of deaths in Poor Law hospitals, suggests a population recruited largely from sick and infirm people.

In any case, the question has been answered in an analysis of the admissions to the institutions of the Parish of Glasgow during eight weeks of the present winter, kindly supplied me by Mr. Motion, Clerk to the Parish Council. During this period the admissions numbered 2,393, of whom 743 had houses of their own, 364 were from one-apartment, and 346 from two-apartment houses, while the two-apartment population is more than three times greater than the one-apartment.

Can these differences be explained ?

Writing some years ago one would have been disposed to leave the inquiry at this point, and to have suggested that if the contrast did not completely establish the case against the smaller-sized house an appeal to the diminishing cubic space per inmate, as the number of rooms decreased, would supply what was wanting in the argument. All this is in a sense true, but the test of the uniform population has shown that the interval which separates the three from the four-apartment death-rate (18 per cent.) is relatively greater than the difference between the rates for the one and two-apartment population (17 per cent.), if we are to accept 20 per 1,000 as the true death-rate of the smallest size of house. It is to be remembered further, that in the population we are dealing with 66 per cent. of the houses are of not more than two rooms, and that 62 per cent. of the population inhabit them—that in six only of our City Divisions (or Wards) is the proportion of one-apartments below 10 per cent. ; that in nine wards they form from 10 to 20 per cent., and in six wards vary from 20 to 30 per cent. of the total houses, while in five wards the proportion is above 30 per cent. The smaller-sized houses

are, therefore, distributed throughout the City in varying proportions, and their room density reaches a high average.

It is an old observation in Glasgow that the number of occupants per room increases as the number of rooms decrease, and during the period we are considering the average number of inmates in *one*-apartment houses was 3·2, varying, however, from 1·8 to 3·5 in the different wards ; in *two*-apartment houses the occupants average 2·4 per room ; in *three*-apartment houses 1·7, and in houses of *four* apartments 1·3.

I now propose to ask to what extent the influence of these varying conditions may be traced in the causes of death among the several age-groups, according to the size of house which they occupy.

The Causes of Death at Ages under 5.

I select the causes of death at these ages for further inquiry because of the importance attaching to them as indices of insanitary conditions. The following general statement shows the rate per 1,000 from all causes at these ages :—

	Under 1		1—5		Death-rate under 1 = 100
	Death-rate	Comparative number	Death-rate	Comparative number	Death-rate 1—5
1 apartment	210·25	100	40·56	100	= 19
2 apartments	163·8	78	30·20	74	18
3 apartments	128·5	61	17·94	44	14
4 apartments and upwards ...	102·57	49	10·29	25	10
Institutions and shipping ...	374·07	—	51·95	—	—

The contrast in the rates at each age-period associated with the house groups here shown is sufficiently striking, but what seems to me of almost equal significance is the rapid improvement in the rate at ages 1-5 in three- and four-apartment houses. Under 1 year the four-apartment rate is still equal to one-half the rate for one-apartments, but during the next four years of life the resistance of the child in three- and four-apartment houses to fatal disease increases so rapidly, or the risks of contracting infectious disease are so diminished, that the death-rate among children in three-apartment houses is less than

one-half, and in four-apartment houses only one-fourth that of one-apartment children.

If we attach a numerical value of 100 to the infant death-rate in each size of house, the one- and two-apartment child has still during the next four years to encounter a risk which can be represented by 19 and 18 respectively compared with 14 and 10 in three- and four-apartment children. A consideration of the causes of death at these ages may throw some light on the factors which produce these differences.

Causes of Death in Infancy.

If we represent the one-apartment infant death-rate by 100, then the two, three, and four and larger houses may be stated at 78, 61, and 49. Can this difference be ascribed wholly to housing conditions affecting the child directly? In the endeavour to find an answer I have taken out the rates for thirty separate causes of death, and two other groups to include cases where the causes of death were unknown, or were not further analysed.

It was submitted in evidence to the Committee on Physical Deterioration[1] that " in no single case has it ever been asserted that ill-nourished or unhealthy babies are more frequent at time of birth among the poor than among the rich. . . . The poorest and most ill-nourished women bring forth as hale and strong-looking babies as those in the very best conditions. In fact, it almost appears as though the unborn child fights strenuously for its own health at the expense of the mother and arrives in the world with a full chance of living a normal physical existence." If one applies to this the test which is afforded by the ability of the child to lead a separate existence apart from its mother, one finds, on the contrary, quite definite evidence, I think, that children do not enter life with an equal chance of surviving, and that the chances are least in the smallest size of house.

Among the causes of death of males under 1 year the rate for premature birth in *one*-apartment houses is equal to 30 per 1,000 ; in *two*- and *three*-apartments it is 24 and 25 respectively ; in *four*-apartments 20, and in institutions 41. In the case of females the corresponding rates are 24, 21, 14, and 20 ; but the institution rate is 68 compared with 40 for females. These differences are not due to any direct influence which the smaller houses exert on the child after birth, but to a combination of influences acting on the mother during the

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[1] Minutes of Evidence, p. 31, question 556.

ante-natal period at least, probably during the whole antecedent period of her life, and impairing, I believe, her own health and the vitality of her offspring.

A priori one would have been disposed to suggest deficiency in food and rest as being included among the deteriorating influences directly affecting the mother. Experimental feeding of pregnant animals might be appealed to in favour of the suggestion of deficiency in food supply. Evidence of a more direct character is, however, available in an inquiry into the dietary of the labouring classes in Glasgow carried out during the past year by Miss Dorothy Lindsay, B.Sc., formerly Carnegie Research Fellow in the University of Glasgow, and contained in a report recently issued by the Corporation. Her observations bear so directly on the inadequacy of the dietary which prevails to an unknown extent among the population in whom the excessive death-rate from prematurity occurs, that I quote from her observations on sample dietaries in families with regular wages under 20s. per week.

Number of Study			Protein in grammes		Fat in grammes		Carbohydrate in grammes		Calories
XVII	...	...	103·0	...	63·5	...	467·9	..	2931·2
XXV	...	...	82·6	...	75·0	...	320·7	...	2351·0
XXVIII	...	...	96·4	...	67·8	...	423·2	...	2760·9
XLII	...	...	98·9	..	88·1	...	377·4	...	2772·2
LII	...	...	108·1	...	87·1	...	337·1	...	2635·3
Standard		...	120·0	...	100·0	...	500·0	...	3472·0

Miss Lindsay observes : " In this section, which embraces those who may properly be called poor, not one diet reaches the minimum energy value of 3,000 calories," and, she adds, " the children are nearly all small and light in weight." It is beside the point at the moment to inquire whether this insufficiency in dietary is concurrent with other causes of inefficiency in the parents; my purpose is rather to suggest that it constitutes a handicap on the life of the child at birth, and that it becomes of importance to discover whether this handicap is extinguished by the excessive death-rate from prematurity, or is reinforced by the external influences into which the child is born. Is there, in point of fact, any evidence that in the later period of childhood he is more prone to diseases which are not the mere accidents of infection than a child born under more favourable surroundings ?

In Glasgow respiratory diseases are slightly more fatal to infant life than diseases of the digestive organs (29 and 28 per 1,000 births for male, and 24 and 21 for female infants), but I take the latter group first, because the diseases of which it is composed predominate from

the second to the sixth month of life, and probably more accurately represent the field in which the child carries on the struggle for an independent existence. I place the rates for the diarrhœal group, and for other diseases of digestion separately, and combined.

MALES, AGED UNDER 1. DISEASES OF DIGESTION.

			Death-rate per 1,000		
			Diarrhœa or enteritis	Other digestive disorders	Both
1 apartment	...	...	25·32 = 100 ...	7·43 = 100 ...	32·75
2 ,,	...	..	19·72	6·09 ...	25·81
3 ,,	...	...	10·48	4·44 ...	14·92
4 ,,	and upwards		12·02 = 47 ..	4·81 = 64 ...	16·83

The outstanding features of this comparison are, I think, the exaggerated prevalence of what may be regarded as the results of food infection in the smaller-sized houses, and the more uniform distribution of the rate ascribed to the other forms of diseases of the digestive organs. With regard to these latter, however, which may be regarded as due to a low standard of innervation, I suggest that part at least of the difference is consistent with a continuance of the handicap which in the earlier months of life found expression as prematurity because, while at ages 0 to 5 the excess in the smaller houses is quite marked, from 5 to 35, and again after 65, the relationship is reversed, and the higher rates tend to fall on the larger houses.

DISEASES OF THE NERVOUS SYSTEM.

This view gains some support, I think, from the variations which occur in the incidence of diseases of the nervous system other than non-tubercular meningitis and cerebral hæmorrhage, which latter is, however, not properly a disease of the nervous system at all.

Until the completion of the twentieth year in both sexes the higher rates tend to prevail in the smaller houses, but after this age there is an increasing tendency to find the one-apartment rates exceeded among the inhabitants of houses of other sizes, and to become associated with a change in the type of disease from the convulsive to the degenerative variety. Owing to the differences in age constitution, however, these variations are obscured in a statement of the rate at all ages.

MALES UNDER 1. DEATH-RATES FROM DISEASES OF NERVOUS SYSTEM.

			Meningitis (not tubercular)	Cerebral hæmorrhage	Other diseases of nervous system	All diseases of nervous system
1 apartment	...	...	3·74 ...	0·55 ...	9·77 ...	14·06
2 apartments	...	...	2·98 ...	0·13 ...	6·59 ...	9·70
3 ,,	...	...	2·54 ...	0·63 ...	5·08 ...	8·25
,,	and upwards	...	3·21 ...	0·80 ..	7·21 ...	11·22

DISEASES OF THE ORGANS OF RESPIRATION.

In relation to house-incidence, the principal disease of this group—pneumonia—presents an almost complete contrast to the groups we have been considering. At each age-period almost without exception the higher rates fall on the houses of one and two apartments. It would therefore seem to be a disease entirely of environment and climatic conditions, resembling in its behaviour, indeed, those of a more definitely infectious type. In infancy the rate for the larger houses is equal to two-thirds that of one apartment, but a greater interval separates the rates from bronchitis, and is probably related to the increasing air impurity in houses of smaller size.

DISEASES OF RESPIRATORY ORGANS. MALES UNDER 1.

	Pneumonia	Bronchitis	Other diseases of respiratory organs	All diseases of respiratory organs
1 apartment	21·46 ...	13·35 ...	4·95 ...	39·76
2 apartments	21·05 ...	11·54 ..	2·92 ...	35·51
3 ,, ...	15 56 ...	6·67 ...	4·44 ...	26·67
4 ,, and upwards ...	14·42 ..	5·61 ...	— ...	20·03

THE PRINCIPAL INFECTIOUS DISEASES OF CHILDHOOD.

For the purposes of this comparison I have selected the principal infectious diseases of childhood—viz., measles, whooping-cough, scarlet fever, diphtheria, membranous croup, and cerebrospinal fever.

MALES UNDER 1 : DEATH-RATES PER 1,000.

	Measles (1)	Whooping-cough (2)	Scarlet fever (3)	Diphtheria and membranous croup (4)	Cerebro-spinal fever (5)	Total of columns 1, 2, 4	Comparative number
1 apartment	11·70	10·46	0·28	1·10	0·28	23·26	= 100
2 apartments	9·57	7·42	0·32	1·01	0·51	18·00	—
3 ,, ...	3·49	5·71	0·32	0·95	—	10·15	—
,, and upwards	0·80	4·01	—	0·80	—	5·61	= 24

MALES, 1—5 : DEATH-RATE PER 1,000.

	Measles (1)	Whooping-cough (2)	Scarlet fever (3)	Diphtheria and membranous croup (4)	Cerebro-spinal fever (5)	Total of columns 1, 2, 3, 4	Com-parative number
1 apartment	8·63	4·36	1·26	2·02	0·13	16·27	= 100
2 apartments	5·90	2·79	0·97	1·56	0·18	11·22	—
3 ,, ...	2·85	1·42	0·22	1·87	0·30	6·36	—
4 ,, and upwards	1·01	0·67	—	1·01	—	2·69	= 17

In order to cover the age-period of greatest susceptibility, I have included the ages 0-5, and in them there is a definite grading in relation to house-room with the exception of cerebrospinal fever, the house distribution of which (in the period under review) was apparently quite erratic. The rate of " all ages " was greatest in one-apartment houses, but no fatal cases occurred in them after the age-period 10-15 : it was less than in two-apartment houses at ages 0-5 ; whereas fatal cases do not appear in houses of four apartments and upwards until the age-period 5-10, and they continue till the age-period 35-65.

TUBERCULOUS DISEASES.

In the circumstances of the movement considerable interest attaches to the house distribution of diseases of this class. From pulmonary tuberculosis the overhead reduction during the decade has been about 25 per cent., and this is fairly maintained in each class of house, save in four apartments and upwards. For both sexes the rates in 1901 and 1909-12 are as follows :—

PULMONARY TUBERCULOSIS. ALL AGES. DEATH-RATE PER 1,000.

		1 apart-ment	2 apart-ments	3 apart-ments	4 apartments and upwards	All houses	Institutions, &c.	City
1901	Both sexes	2·4	1·8	1·2	0·7	--	7·4	1·8
1909-12		1·76	1·26	0·91	0·66	—	6·9	1·34
1909-12—								
Males ...		1·60	1·25	1·05	0·9	1·20	7·3	1·48
Females ...		1·90	1·27	0·78	0·49	1·11	6·4	1·21

Directly, however, we distinguish between the sexes we find that the female rate at all ages is higher than the male in houses of one and two apartments, and generally that in one-apartment houses it is below the male rate only at ages 20-25 and 45-75, and in two-apartment houses at ages 1-5, 20-25, and from 45 upwards. An excessive drift of male consumptives at these ages to parochial hospitals might tend somewhat to explain this excessive female incidence in houses, but there is no evidence of this in the institutional death-rate, which shows, indeed, a continuously excessive female rate at ages 5-55, save between 10 and 15, and again from 25-35.

In three- and four-apartment houses the rate for males of all ages exceeds that of females. In three-apartment houses, however, the female rate exceeds the rate at ages under 20, while in four apartments the female excess occurs only at the period 5-10, and again over 75. Applying the test of our standard population to these rates, the association with the house appears to be quite definite :—

CALCULATED DEATHS IN UNIFORM POPULATION.

Population		1 apartment	2 apartments	3 apartments	4 apartments	Institutions and shipping
Males	48,605	... 86	... 66	... 48	... 39	... 245
Females	51,395	... 102	... 70	... 39	... 22	... 327
Death-rate	100,000	... 188	... 136	... 87	... 61	... 572
Males only						
Tuberculous meningitis	...	15 ...	15 ...	14 ...	10 ...	18
Abdominal tuberculosis	...	12 ...	10 ...	7 ..	3 ...	11

I have placed the corresponding figures for tubercular meningitis and abdominal tubercle along with those relating to pulmonary tuberculosis because they seem to me to supply part at least of the answer to a question which frequently puzzled me—I mean the apparent lack of parallelism between the local distribution of pulmonary and the other forms of tuberculosis. When tested by the standard of a uniform population, however, they fall into line with the distribution of phthisis.

CANCER (MALIGNANT DISEASE).

The absence of association between new growths of a malignant character and housing, in the sense we are at present dealing with it, has not escaped attention in the past. In the present inquiry the rate for each sex at all ages in houses of three apartments and upwards is higher than in one and two apartments, but lower than in institutions.

At ages under 25 its distribution is irregular both in relation to age and housing, but it appears as a cause of death at every age-period thereafter and in every grade of house. At these ages the rate for males in one-apartments is lower than in larger houses, save from 35-55. In one-apartment females, the chief exception is at ages 45-55. In three-apartment females, the higher rates which properly belong to the later ages would appear to begin a decade earlier—i.e., at ages 35-45. The number of deaths in institutions, however, which cannot be allocated, but which occur among persons largely recruited from the one-apartment population, would probably affect the relationship of these rates.

SUMMARY.

In endeavouring to summarize the results of this inquiry it is pertinent to ask whether the several groups of population we have been considering can be regarded as in any way permanent sections of a population. I think the death-rates which prevail among them forbid an assumption of this character. They are too low. They are not the rates of a stationary population, but to my thinking suggest an ebb and flow of families caught in successive waves of good or evil fortune. This interchange we have seen is actually taking place to a recognizable extent in the case of the one- and two-apartment population and the Poor Law. To what extent it is also in progress between the occupants of three and four apartments and upwards there are no present means of determining. That they do occur is, I think, evident from the low range of death-rates which the larger sized houses present.

It may be urged that selective forces are in operation determining the movement of population in the direction of a particular size of house and that these rather than the surroundings in which they are recognized are the determining factors in the death-rate. I think the inquiry suggests that this is the case in certain diseases of digestion and of the nervous system. It is otherwise with regard to infectious disease. Here the element " house " predominates, I think, for the death-rates per 1,000 from the principal infectious diseases of childhood and pneumonia at ages 1-5 are sixteen and six for one-apartment houses, twelve and six for two-apartment houses, but only seven and two for three-apartment houses, and three and one for four apartments and upwards. Before reaching these ages, however, the children born in the smaller sized houses display evidence of a serious

TABLE I.—1909-1912. MALES—ONE-APARTMENT HOUSES. DEATH-RATES PER 1,000 FROM SEVERAL CAUSES AT VARIOUS AGE PERIODS.

Cause of death							Age						
	-1	-5	-10	-15	-20	-25	-35	-45	-55	-65	-75	75+	All ages
(1) Smallpox	—	—	—	—	—	—	—	—	—	—	—	—	—
(2) Diphtheria and membranous croup	1·10	2·02	0·19	—	—	—	—	—	—	—	—	—	0·40
(3) Enteric fever	—	0·09	—	0·21	0·29	0·18	—	—	0·20	—	—	—	0·19
(4) Typhus fever	—	—	—	—	—	—	—	—	—	—	—	—	0·01
(5) Scarlet fever	0·26	1·26	0·26	0·21	—	—	0·03	0·05	—	—	—	—	0·23
(6) Cerebro-spinal fever	0·28	0·13	0·32	—	—	—	0·40	0·16	—	—	—	—	0·08
(7) Measles	11·70	8·63	0·19	—	—	—	—	—	—	—	—	—	1·95
(8) Whooping cough	10·46	4·36	0·13	—	—	—	—	—	—	—	—	—	1·21
(9) Diarrhœa and enteritis	25·32	2·70	0·26	0·10	0·15	0·27	0·29	0·16	—	—	0·65	—	1·73
(10) Other digestive diseases	7·43	0·67	—	—	—	—	—	0·54	1·29	2·22	0·97	—	0·87
(11) Puerperal fever	—	—	—	—	—	—	—	—	—	—	—	—	—
(12) Erysipelas	0·28	0·09	—	—	—	—	—	—	0·10	—	0·32	—	0·05
(13) Other septic diseases	0·41	0·22	0·39	—	0·29	—	0·23	0·05	0·49	0·51	0·32	—	0·27
(14) Phthisis (pulmonary)	0·14	0·67	0·65	0·31	2·08	1·98	1·70	2·49	3·86	2·90	2·27	2·41	1·60
(15) Tuberculous meningitis	3·85	1·89	0·45	0·21	0·15	0·09	0·03	—	—	—	—	—	0·56
(16) Abdominal tuberculosis	2·75	1·30	0·19	0·21	0·15	0·36	0·12	—	0·10	—	0·32	—	0·39
(17) Other tuberculous diseases	2·61	0·58	0·45	0·31	—	0·18	0·06	—	—	0·34	0·65	—	0·39
(18) Cancer (malignant disease)	—	0·22	0·06	—	—	—	—	0·65	2·57	4·10	4·21	4·81	0·61
(19) Rheumatic fever	—	—	0·10	0·10	0·15	—	—	—	—	—	—	—	0·01
(20) Meningitis (not tuberculous)	3·71	1·12	0·39	0·10	0·15	0·18	0·06	—	0·10	—	0·65	—	0·46
(21) Cerebral hæmorrhage	0·55	0·07	0·06	—	—	—	—	0·98	1·38	4·44	10·68	9·63	0·65
(22) Other diseases of nervous system	9·77	1·12	0·13	0·21	0·44	0·36	0·52	0·38	0·69	1·20	3·24	6·02	0·94
(23) Circulatory diseases	2·61	0·22	0·19	0·31	0·15	0·72	0·40	1·57	5·14	8·54	16·83	32·49	1·82
(24) Pneumonia	21·46	6·34	0·45	0·41	—	0·09	0·40	2·28	4·25	3·08	4·85	1·20	3·09
(25) Bronchitis	13·35	2·52	0·13	—	0·29	—	0·12	0·54	2·77	5·30	17·47	13·24	2·02
(26) Other respiratory diseases	4·95	0·36	0·06	—	—	—	0·09	0·27	0·49	0·51	0·32	1·20	0·45
(27) Croup	0·28	0·27	—	—	—	—	—	—	—	—	—	—	0·05
(28) Influenza	0·14	0·07	—	1·13	—	—	—	—	—	—	—	—	0·03
(29) Violence	4·13	1·21	0·66	—	0·29	0·63	0·42	1·14	1·58	1·37	2·91	2·41	1·07
(30) Premature births	30·13	—	—	—	—	—	—	—	—	—	—	—	1·50
(31) Unknown	1·65	0·09	—	0·72	—	0·18	0·03	0·11	0·20	0·17	—	—	0·14
(32) All others	50·91	2·34	0·91	—	—	—	0·61	1·46	3·87	6·49	18·45	32·49	4·49
All causes	210·25	40·56	6·97	4·54	4·82	5·24	5·11	12·55	29·18	41·17	85·11	105·90	27·26
Deaths	1,528	902	108	44	33	58	177	232	295	241	263	88	9,969
Census population (× 3)	7,266	22,239	15,495	9,693	6,852	11,055	34,650	18,477	10,110	5,853	3,090	831	145,611

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TABLE II.— 1909-1912. MALES – TWO-APARTMENT HOUSES. DEATH-RATES PER 1,000 FROM SEVERAL CAUSES AT VARIOUS AGE PERIODS.

Cause of death	Age												All ages
	−1	−5	−10	−15	−20	−25	−35	−45	−55	−65	−75	75+	
(1) Smallpox	1·01	1·56	0·46	0·09	—	0·05	—	—	—	—	—	—	0·28
(2) Diphtheria and membranous croup	—	0·03	0·04	0·09	0·06	0·10	0·01	—	—	—	—	—	0·10
(3) Enteric fever	—	—	—	0·06	0·06	0·04	0·25	0·12	0·11	0·05	0·11	—	0·10
(4) Typhus fever	—	—	—	—	—	—	0·02	0·01	—	—	—	—	0·00
(5) Scarlet fever	0·32	0·97	0·86	—	—	—	0·01	0·01	—	—	—	—	0·18
(6) Cerebro-spinal fever	0·51	0·18	0·10	—	—	—	—	—	—	—	—	—	0·05
(7) Measles	9·57	5·90	0·38	—	—	—	—	—	—	—	—	—	0·99
(8) Whooping cough	7·42	2·79	0·14	0·02	—	—	—	—	—	—	—	—	0·54
(9) Diarrhœa and enteritis	19·72	1·59	0·10	0·22	0·31	0·17	0·34	0·03	0·22	0·27	0·74	1·15	0·82
(10) Other digestive diseases	6·09	0·60	0·42	0·22	—	—	—	0·52	0·72	1·59	2·55	5·15	0·69
(11) Puerperal fever	—	—	—	—	—	—	—	—	—	—	—	—	—
(12) Erysipelas	0·32	0·02	—	0·22	0·09	0·05	0·02	0·04	0·13	0·18	0·74	—	0·05
(13) Other septic diseases	0·57	0·10	—	—	—	—	0·01	0·06	0·09	0·41	0·53	—	0·11
(14) Phthisis (pulmonary)	0·38	0·54	0·31	0·57	1·25	2·49	1·74	1·67	2·00	1·96	1·17	—	1·25
(15) Tuberculous meningitis	4·82	1·64	0·34	0·19	0·13	0·05	0·01	0·01	0·02	0·05	—	—	0·41
(16) Abdominal tuberculosis	2·22	0·96	0·44	0·16	0·04	0·02	0·02	0·06	—	—	—	—	0·26
(17) Other tuberculous diseases	1·01	0·50	0·18	0·17	0·17	0·27	0·06	0·06	0·18	0·09	0·21	—	0·21
(18) Cancer (malignant disease)	—	0·02	—	0·05	0·04	0·02	0·16	0·63	2·10	4·78	6·27	7·45	0·62
(19) Rheumatic fever	—	0·03	0·01	0·02	0·02	0·02	—	0·04	0·02	0·04	—	—	0·02
(20) Meningitis (not tuberculous)	2·98	1·02	0·21	0·05	0·08	0·02	0·02	0·04	0·04	0·05	—	—	0·26
(21) Cerebral hæmorrhage	0·13	0·05	—	0·02	0·02	0·07	0·06	0·14	0·90	3·82	8·40	20·62	0·48
(22) Other diseases of nervous system	6·59	1·15	0·16	0·09	0·15	0·61	0·17	0·18	0·65	0·86	3·30	5·15	0·58
(23) Circulatory diseases	2·09	0·18	0·19	0·25	0·46	0·37	0·46	1·34	3·12	7·15	16·59	28·06	1·40
(24) Pneumonia	21·05	5·75	0·49	0·21	0·27	0·15	0·50	1·20	2·83	4·00	6·16	7·45	2·16
(25) Bronchitis	11·54	1·19	0·08	0·02	0·06	0·10	0·18	0·36	1·64	5·42	11·27	23·48	1·19
(26) Other respiratory diseases	2·92	0·26	0·03	0·03	0·02	—	0·07	0·27	0·36	0·68	0·74	1·72	0·25
(27) Croup	1·71	0·21	0·01	—	—	—	—	—	—	—	—	—	0·07
(28) Influenza	0·25	0·06	0·01	0·17	—	—	0·03	0·03	0·22	0·27	0·42	—	0·06
(29) Violence	1·84	0·93	0·36	0·17	0·27	0·32	0·53	1·19	1·37	1·82	1·91	4·01	0·75
(30) Premature births	24·34	—	—	—	—	—	—	—	—	—	—	—	0·70
(31) Unknown	1·08	0·02	0·01	—	—	—	0·01	0·06	0·16	0·09	0·21	—	0·06
(32) All others	33·40	1·95	0·73	0·46	0·44	0·41	0·72	1·00	2·40	6·15	14·78	53·83	2·53
All causes	163·88	30·20	5·56	3·16	3·94	5·40	5·42	9·01	19·30	39·69	76·12	158·07	17·07
Deaths	2,585	1,859	407	200	205	222	474	700	860	872	716	276	9,876
Census population (× 9)	15,774	61,542	78,140	63,228	52,077	41,001	87,869	77,622	44,526	21,969	9,405	1,746	549,999

TABLE III.—1909-1912. MALES—THREE-APARTMENT HOUSES. DEATH-RATES PER 1,000 FROM SEVERAL CAUSES AT VARIOUS AGE PERIODS.

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Cause of death	-1	-5	-10	-15	-20	-25	-35	-45	-55	-65	-75	75+	All ages
(1) Smallpox	0·95	1·87	0·70	0·12	0·03								0·20
(2) Diphtheria and membranous croup			0·05		0·07		0·20	0·07	0·08				0·06
(3) Enteric fever										0·06			0·00
(4) Typhus fever													0·06
(5) Scarlet fever	0·32	0·22	0·19	0·12	0·03	0·04			0·04				0·03
(6) Cerebro-spinal fever		0·30			0·03	0·04		0·03					0·03
(7) Measles	3·49	2·85	0·19										0·23
(8) Whooping cough	5·71	1·42	0·05										0·16
(9) Diarrhœa and enteritis	10·48	1·12	0·05		0·03		0·03	0·07	0·04	0·31	0·94	4·66	0·30
(10) Other digestive diseases	4·44	0·45	0·24	0·26	0·23	0·29	0·34	0·24	0·66	1·38	0·94	1·55	0·48
(11) Puerperal fever													
(12) Erysipelas	1·27				0·10	0·04		0·07	0·19	0·13	0·16		0·06
(13) Other septic diseases				0·04						0·06	0·16		0·03
(14) Phthisis (pulmonary)	0·32	0·30	0·05	0·19	0·86	1·33	1·68	1·02	2·07	1·57	0·79		1·05
(15) Tuberculous meningitis	2·54	1·79	0·14	0·12	0·27	0·07							0·22
(16) Abdominal tuberculosis	0·63	0·82	0·24			0·07	0·05	0·03	0·04	0·06	0·16		0·12
(17) Other tuberculous diseases	0·32	0·30	0·19	0·16	0·17	0·07	0·08	0·21	0·12	0·19			0·15
(18) Cancer (malignant disease)			0·09		0·03	0·04	0·25	0·49	1·21	4·01	8·64	6·22	0·79
(19) Rheumatic fever					0·03	0·04			0·04	0·06	0·16		0·02
(20) Meningitis (not tuberculous)	2·54	0·60	0·05	0·08	0·08	0·07	0·06	0·07					0·10
(21) Cerebral hæmorrhage	0·63			0·04	0·04	0·04	0·11	0·10	0·98	3·51	8·65	17·87	0·73
(22) Other diseases of nervous system	5·08	0·67	0·19	0·04	0·04	0·25	0·14	0·24	0·58	0·81	3·46	9·32	0·46
(23) Circulatory diseases	3·49	0·30	0·09	0·23	0·10	0·47	0·28	1·16	2·38	5·20	15·24	18·65	1·47
(24) Pneumonia	15·56	2·25	0·24	0·12	0·27	0·04	0·56	1·05	1·95	2·75	2·83	3·11	1·17
(25) Bronchitis	6·67	0·97			0·27	0·07	0·11	0·14	1·01	2·88	7·55	12·43	0·76
(26) Other respiratory diseases	4·44	0·15		0·04			0·03	0·24	0·43	0·56	1·26	0·78	0·24
(27) Croup		0·07	0·05						0·04				0·01
(28) Influenza	0·32	0·07			0·03				0·08	0·44	0·79	1·55	0·08
(29) Violence	1·27	0·30	0·28	0·08	0·13	0·22	0·42	0·88	0·86	0·69	0·63	1·55	0·45
(30) Premature births	25·40												0·34
(31) Unknown		0·07						0·07		0·06	0·16	0·78	0·02
(32) All others	32·38	1·05	0·41	0·42	0·43	0·62	0·56	1·40	1·83	4·70	11·63	67·60	2·17
All causes	128·25	17·94	3·49	2·18	3·14	3·81	4·90	7·61	14·63	29·49	64·15	146·07	11·96
Deaths	404	240	74	56	95	105	175	217	375	471	408	188	2,808
Census population (× 3)	3,150	13,377	21,273	25,644	30,171	27,549	35,718	28,521	25,626	15,972	6,360	1,287	234,648

TABLE IV.—1909-1912. MALES—FOUR-APARTMENT HOUSES AND UPWARDS. DEATH-RATES PER 1,000 FROM SEVERAL CAUSES AT VARIOUS AGE PERIODS.

Cause of death		—1	—5	—10	—15	—20	—25	—35	—45	—55	—65	—75	75+	All ages
(1) Smallpox		—	—	—	—	—	—	—	—	—	—	—	—	—
(2) Diphtheria and membranous croup		0·80	1·01	0·30	0·08	—	—	—	—	—	—	—	—	0·07
(3) Enteric fever		—	—	0·10	0·08	0·16	—	0·03	0·10	—	0·07	—	—	0·06
(4) Typhus fever		—	—	—	—	—	—	—	0·05	—	—	—	—	0·01
(5) Scarlet fever		—	—	0·77	0·21	0·05	—	—	—	—	—	—	—	0·08
(6) Cerebro-spinal fever		—	—	0·20	0·08	0·05	—	0·03	0·05	0·05	0·07	0·14	—	0·04
(7) Measles		0·80	1·01	0·30	—	—	—	—	—	—	—	—	—	0·07
(8) Whooping cough		4·01	0·67	0·20	—	—	—	—	—	—	—	—	—	0·07
(9) Diarrhœa and enteritis		12·02	0·50	0·20	0·15	0·16	0·09	0·14	0·29	0·42	0·14	0·28	1·68	0·31
(10) Other digestive diseases		4·81	—	0·10	—	0·16	0·24	0·49	0·39	1·14	1·22	3·23	5·05	0·68
(11) Puorperal fever		—	—	—	—	—	—	—	—	—	—	—	—	—
(12) Erysipelas		0·80	—	—	—	—	—	0·03	—	0·10	0·14	0·14	0·56	0·03
(13) Other septic diseases		0·80	—	0·10	0·15	—	—	0·03	—	—	0·14	0·14	—	0·04
(14) Phthisis (pulmonary)		—	0·34	0·20	0·15	0·53	1·04	1·29	1·66	1·08	0·88	0·56	—	0·90
(15) Tuberculous meningitis		2·40	1·35	—	0·08	0·11	—	—	—	—	—	—	—	0·10
(16) Abdominal tuberculosis		—	0·50	—	—	—	—	0·03	0·05	—	—	—	—	0·04
(17) Other tuberculous diseases		1·60	0·34	0·10	0·08	0·11	0·19	0·14	0·10	—	0·14	—	—	0·12
(18) Cancer (malignant disease)		—	0·17	—	—	—	0·09	0·21	0·24	1·30	3·53	8·15	9·54	1·03
(19) Rheumatic fever		—	—	—	0·15	0·11	—	0·03	—	0·10	0·07	—	—	0·01
(20) Meningitis (not tuberculous)		3·21	0·84	0·10	—	—	—	—	0·05	0·10	—	—	—	0·10
(21) Cerebral hæmorrhage		0·80	—	0·10	—	0·05	0·19	0·10	0·15	0·78	2·03	7·03	14·03	0·77
(22) Other diseases of nervous system		7·21	0·84	—	—	0·32	0·24	0·39	0·44	0·62	1·35	2·81	11·78	0·62
(23) Circulatory diseases		1·60	—	0·10	0·15	0·16	—	0·39	1·07	2·22	6·16	15·76	33·68	2·18
(24) Pneumonia		14·42	1·35	0·20	0·15	—	0·24	0·39	1·32	1·40	2·17	4·92	4·49	1·09
(25) Bronchitis		5·61	0·17	0·10	—	0·11	0·09	0·03	0·20	0·62	1·83	6·61	11·78	0·74
(26) Other respiratory diseases		—	0·34	—	—	—	—	0·03	0·20	0·26	0·47	0·84	2·24	0·20
(27) Croup		0·80	0·17	—	—	—	—	—	—	—	—	—	—	0·01
(28) Influenza		—	—	—	—	0·11	—	—	—	0·05	0·34	0·84	1·68	0·09
(29) Violence		—	0·17	0·30	0·08	0·26	0·14	0·17	0·68	0·52	0·75	1·12	2·24	0·40
(30) Premature births		20·04	—	—	—	—	—	—	—	—	—	—	—	0·15
(31) Unknown		0·80	—	—	—	—	—	—	0·05	0·05	0·20	—	—	0·04
(32) All others		20·04	1·00	—	0·21	0·37	0·42	0·36	1·42	3·78	6·23	14·90	58·37	2·84
All causes		102·57	10·27	3·47	1·80	2·71	2·97	3·92	8·50	14·49	27·79	67·47	157·12	12·89
Deaths		128	61	35	24	51	63	113	174	279	410	480	280	2,098
Census population (× 3)		1,248	5,946	10,086	18,299	18,810	21,219	28,725	20,475	19,266	14,751	7,113	1,782	162,720

TABLE V.—1909-1912. MALES—INSTITUTIONS AND HARBOUR. DEATH RATES PER 1,000 FROM SEVERAL CAUSES AT VARIOUS AGE PERIODS.

Cause of death	Age												All ages
	-1	-5	-10	-15	-20	-25	-35	-45	-55	-65	-75	75+	
(1) Smallpox	—	—	—	—	—	—	—	—	—	—	—	—	0·02
(2) Diphtheria and membranous croup	—	0·67	—	—	—	—	—	—	—	0·16	—	—	0·12
(3) Enteric fever	—	—	—	—	—	0·20	0·20	0·19	—	—	—	—	—
(4) Typhus fever	—	—	—	—	—	—	—	—	—	—	—	—	—
(5) Scarlet fever	—	1·35	—	—	0·43	—	—	—	—	—	—	—	0·06
(6) Cerebro-spinal fever	—	—	—	—	0·43	—	—	—	—	—	—	—	0·02
(7) Measles	11·11	14·16	1·09	—	—	—	—	—	—	—	—	—	0·50
(8) Whooping cough	107·41	0·67	—	—	—	—	—	—	—	—	—	—	0·02
(9) Diarrhœa and enteritis	11·11	13·51	—	—	—	—	0·10	—	0·23	—	—	1·41	1·03
(10) Other digestive diseases	—	2·02	—	—	0·43	0·20	0·50	0·48	0·35	0·81	1·16	2·82	0·62
(11) Puerperal fever	—	—	—	—	—	—	—	—	—	—	—	—	—
(12) Erysipelas	—	—	—	—	—	—	—	0·19	0·23	0·16	0·29	2·82	0·12
(13) Other septic diseases	3·70	—	—	—	—	—	0·20	—	0·23	0·33	0·87	1·41	0·23
(14) Phthisis (pulmonary)	14·82	0·67	—	1·27	2·55	4·25	6·66	8·58	8·96	11·89	10·11	5·65	7·26
(15) Tuberculous meningitis	—	—	1·64	—	—	—	—	0·10	—	—	—	—	0·10
(16) Abdominal tuberculosis	33·33	0·67	7·12	—	—	—	—	—	—	—	—	—	0·08
(17) Other tuberculous diseases	—	4·05	—	0·64	—	—	—	0·67	0·59	0·49	0·87	—	1·05
(18) Cancer (malignant disease)	—	—	—	0·64	1·28	0·20	0·30	0·29	2·12	4·72	6·64	5·65	1·51
(19) Rheumatic fever	—	—	—	—	—	—	—	—	—	—	—	—	—
(20) Meningitis (not tuberculous)	—	—	—	0·64	—	—	0·10	0·10	—	—	—	—	0·06
(21) Cerebral hæmorrhage	—	—	—	—	—	—	0·30	0·19	2·47	6·35	12·71	15·54	2·33
(22) Other diseases of nervous system	3·70	0·67	1·09	—	0·43	0·20	0·40	0·87	1·53	1·30	2·60	7·06	1·01
(23) Circulatory diseases	25·93	0·67	—	—	—	1·01	1·11	2·12	2·12	13·69	32·64	88·97	6·21
(24) Pneumonia	29·63	2·70	—	—	—	0·61	1·01	2·80	4·01	7·00	10·69	7·06	3·36
(25) Bronchitis	—	6·75	—	—	—	0·20	—	0·77	2·24	6·51	17·62	24·01	3·18
(26) Other respiratory diseases	—	—	—	—	—	—	—	0·38	0·23	0·81	1·44	5·65	0·39
(27) Croup	—	—	—	—	—	—	—	—	—	—	—	—	—
(28) Influenza	—	—	—	—	—	—	—	—	—	—	—	—	—
(29) Violence	—	—	—	1·27	0·85	0·40	0·61	1·75	1·88	2·28	2·31	1·41	1·30
(30) Premature births	40·74	—	—	—	—	—	—	—	—	—	—	—	0·21
(31) Unknown	92·59	—	—	—	—	—	0·20	0·19	0·35	0·65	0·58	1·41	0·27
(32) All others	—	3·37	2·19	1·27	—	0·40	1·41	1·83	5·43	10·10	19·34	63·53	5·65
All causes	374·07	51·95	13·13	5·74	6·40	7·67	13·10	21·50	32·97	67·25	119·87	234·45	36·71
Deaths	101	77	24	9	15	38	130	223	280	413	415	166	1,891
Census population (× 3)	270	1,482	1,827	1,569	2,343	4,950	9,918	10,374	8,490	6,141	3,462	708	51,594
City (all males)	171·29	30·01	5·32	2·94	3·62	4·59	5·44	9·94	19·34	37·21	77·54	157·07	17·61
Deaths	4,746	3,139	648	333	399	486	1,069	1,546	2,089	2,407	2,282	998	20,142
Census population (× 3)	27,708	104,586	121,821	113,433	110,253	105,774	196,380	155,469	108,018	64,686	29,430	6,354	1,143,912

TABLE VI.—1909-1912.   FEMALES—ONE-APARTMENT HOUSES.   DEATH-RATES PER 1,000 FROM SEVERAL CAUSES AT VARIOUS AGE PERIODS.

Cause of death						AGE							
	—1	—5	—10	—15	—20	—25	—35	—45	—55	—65	—75	75+	All ages
(1) Smallpox	—	—	—	—	—	—	—	—	—	—	—	—	—
(2) Diphtheria and membranous croup	1·23	1·83	0·51	0·10	—	—	0·03	—	—	—	—	—	0·35
(3) Enteric fever	—	—	0·06	—	—	0·06	0·18	0·05	0·08	—	—	—	0·07
(4) Typhus fever	—	—	—	—	—	—	—	—	—	—	—	—	—
(5) Scarlet fever	0·41	1·03	0·51	—	—	—	—	—	—	—	—	—	0·20
(6) Cerebro-spinal fever	0·69	0·09	0·06	—	—	—	—	—	—	—	—	—	0·05
(7) Measles	7·68	7·85	0·57	—	—	—	0·03	—	—	—	—	—	1·43
(8) Whooping cough	10·84	4·10	0·13	0·10	—	0·06	0·05	—	—	—	—	—	1·03
(9) Diarrhœa and enteritis	19·62	2·63	0·13	0·20	0·23	0·22	0·18	0·64	0·15	0·44	0·89	2·53	1·85
(10) Other digestive diseases	5·08	0·62	0·13	0·42	0·35	—	—	0·54	0·86	1·65	1·94	2·11	0·75
(11) Puerperal fever	—	—	—	—	—	0·60	0·55	—	—	—	—	—	0·27
(12) Erysipelas	0·41	0·04	—	—	0·12	0·16	—	0·16	0·15	0·33	0·15	—	0·10
(13) Other septic diseases	0·27	0·13	—	0·20	0·12	0·44	0·26	0·38	0·23	0·22	—	0·42	0·23
(14) Phthisis (pulmonary)	0·96	0·67	0·57	1·33	2·10	1·96	2·32	4·04	2·97	1·43	0·74	1·26	1·90
(15) Tuberculous meningitis	2·47	1·38	0·51	—	0·12	—	0·03	0·05	—	—	—	—	0·36
(16) Abdominal tuberculosis	1·37	1·07	0·57	0·20	0·23	—	0·05	0·20	—	—	—	—	0·33
(17) Other tuberculous diseases	0·82	0·75	0·57	0·30	0·23	0·11	0·05	0·11	0·08	—	—	0·42	0·28
(18) Cancer (malignant disease)	—	—	—	0·10	—	0·22	0·26	0·86	3·50	4·40	6·26	2·53	0·96
(19) Rheumatic fever	—	—	0·06	—	0·12	0·06	—	0·05	0·08	0·11	—	—	0·02
(20) Meningitis (not tuberculous)	3·15	0·89	0·25	—	—	—	0·13	0·11	0·08	—	0·15	—	0·31
(21) Cerebral hæmorrhage	0·27	0·04	—	—	—	—	0·16	0·54	1·71	2·97	6·26	7·16	0·75
(22) Other diseases of nervous system	8·92	0·94	0·06	0·20	0·12	0·05	0·68	0·32	0·39	1·54	1·34	1·26	0·80
(23) Circulatory diseases	1·10	0·13	0·13	—	0·46	0·49	0·47	1·83	4·82	6·38	13·26	13·48	1·94
(24) Pneumonia	17·83	7·14	0·70	0·30	—	0·33	0·26	0·48	2·64	2·31	3·13	4·64	2·52
(25) Bronchitis	12·07	2·05	0·19	—	0·12	0·05	0·05	0·86	4·05	8·24	12·37	18·54	2·49
(26) Other respiratory diseases	2·47	0·35	0·13	—	0·12	0·05	0·05	0·32	0·62	1·10	0·89	1·26	0·39
(27) Croup	0·14	0·22	—	—	—	—	—	—	—	—	—	—	0·03
(28) Influenza	—	—	—	—	—	0·05	—	—	0·08	—	—	—	0·01
(29) Violence	3·57	1·25	0·70	0·30	0·35	—	0·13	0·75	0·93	1·10	1·19	2·53	0·75
(30) Premature births	24·28	0·04	—	—	—	—	—	—	—	—	—	—	1·05
(31) Unknown	1·37	—	—	—	0·12	—	0·08	0·11	0·31	0·22	0·30	—	0·15
(32) All others	36·62	2·23	0·38	0·71	0·70	0·98	1·40	2·42	3·11	4·84	12·22	25·71	4·03
All causes	163·64	37·47	6·92	4·46	5·61	5·89	7·37	14·86	26·84	37·28	61·09	83·85	24·90
Deaths	1,193	841	109	44	48	108	280	276	345	339	410	199	4,192
Census population (× 3)	7,290	22,437	15,720	9,870	8,556	18,324	36,510	18,573	12,855	9,093	6,711	2,373	168,812

TABLE VII.—1909-1912. FEMALES—TWO-APARTMENT HOUSES. DEATH-RATES PER 1,000 FROM SEVERAL CAUSES AT VARIOUS AGE PERIODS.

Cause of death		Age												All ages
		-1	-5	-10	-15	-20	-25	-35	-45	-55	-65	-75	75+	
(1) Smallpox		—	—	—	—	—	—	—	—	—	—	—	—	—
(2) Diphtheria and membranous croup		0·89	1·82	0·50	0·08	—	0·07	0·17	—	0·02	—	—	—	0·30
(3) Enteric fever		0·06	0·02	0·04	0·02	—	0·02	—	0·01	0·02	—	—	—	0·06
(4) Typhus fever		—	—	—	—	—	—	—	—	—	—	—	—	0·01
(5) Scarlet fever		0·32	0·95	0·39	0·05	0·06	0·05	0·03	0·03	—	—	—	—	0·19
(6) Cerebro-spinal fever		0·57	0·16	0·05	0·03	—	0·02	0·01	—	—	—	—	—	0·05
(7) Measles		5·78	5·44	0·46	0·01	—	—	0·01	—	—	—	—	—	0·83
(8) Whooping cough		8·26	2·93	0·20	—	—	—	—	—	—	—	—	—	0·59
(9) Diarrhœa and enteritis		13·20	1·69	0·12	0·01	—	0·20	0·33	0·05	0·21	0·16	0·94	1·72	0·65
(10) Other digestive diseases		3·56	0·39	0·15	0·19	0·18	0·27	0·31	0·47	0·76	1·31	1·88	5·72	0·53
(11) Puerperal fever		—	—	—	—	0·06	—	0·40	0·40	—	—	—	—	0·13
(12) Erysipelas		0·25	—	—	—	0·02	0·10	0·10	0·05	0·14	0·08	0·22	—	0·04
(13) Other septic diseases		0·32	0·03	0·08	0·09	0·02	0·10	0·10	0·17	0·12	0·33	0·22	0·86	0·10
(14) Phthisis (pulmonary)		0·38	0·46	0·41	0·62	1·79	2·13	1·93	2·06	1·59	0·98	0·58	—	1·27
(15) Tuberculous meningitis		2·60	1·55	0·49	0·16	0·10	0·02	0·03	0·01	—	—	—	—	0·35
(16) Abdominal tuberculosis		1·65	0·57	0·34	0·22	0·16	0·10	0·05	0·04	0·07	—	0·07	—	0·22
(17) Other tuberculous diseases		1·90	0·51	0·24	0·19	0·20	0·20	0·09	0·09	0·09	—	—	—	0·23
(18) Cancer (malignant disease)		0·13	—	0·01	0·01	0·02	0·12	0·25	0·74	3·02	6·61	7·29	8·58	0·92
(19) Rheumatic fever		—	—	0·01	0·01	—	—	0·01	0·01	—	—	—	—	0·01
(20) Meningitis (not tuberculous)		1·71	0·61	0·27	0·11	0·02	0·02	0·07	0·35	0·05	—	0·07	—	0·18
(21) Cerebral hæmorrhage		0·32	0·03	0·01	0·02	0·06	—	0·07	0·35	1·20	3·82	8·73	9·44	0·62
(22) Other diseases of nervous system		6·73	0·69	0·15	0·08	0·12	0·15	0·12	0·23	0·55	0·82	2·09	5·15	0·53
(23) Circulatory diseases		1·08	0·05	0·22	0·38	0·46	0·52	0·85	1·46	3·00	6·28	11·91	19·46	1·45
(24) Pneumonia		15·94	4·96	0·36	0·30	0·22	0·40	0·46	0·74	1·52	2·79	3·97	4·86	1·68
(25) Bronchitis		6·35	1·43	0·05	0·05	0·04	0·07	0·23	0·40	1·82	5·62	12·34	20·60	1·28
(26) Other respiratory diseases		2·80	0·21	0·09	0·02	0·06	0·05	0·17	0·26	0·30	0·82	1·08	2·00	0·29
(27) Croup		0·63	0·18	0·01	—	—	—	—	—	—	—	0·07	—	0·04
(28) Influenza		0·25	0·08	0·03	—	—	—	0·01	0·01	0·09	0·25	0·58	0·86	0·06
(29) Violence		1·46	0·64	0·18	0·14	0·10	0·05	0·12	0·25	0·78	0·53	1·44	2·00	0·35
(30) Premature births		21·22	—	—	—	—	—	—	—	—	—	—	—	0·60
(31) Unknown		0·63	0·02	0·03	—	—	0·05	0·01	0·04	0·02	—	0·14	—	0·04
(32) All others		24·32	1·33	0·34	0·36	0·26	0·96	1·14	1·78	3·02	4·96	18·86	48·78	2·52
All causes		123·31	26·75	5·18	3·14	3·95	5·57	6·50	9·75	18·39	35·36	67·48	125·08	16·12
Deaths		1,942	1,628	384	199	200	224	574	728	798	862	935	437	8,911
Census population (× 3)		15,741	60,887	74,001	63,375	50,577	40,161	88,263	74,559	43,388	24,375	13,857	3,495	552,624

TABLE VIII.—1909-1912.   FEMALES—THREE-APARTMENT HOUSES.   DEATH-RATES PER 1,000 FROM SEVERAL CAUSES AT VARIOUS AGE PERIODS.

Cause of death	-1	-5	-10	-15	-20	-25	-35	-45	-55	-65	-75	75+	All ages
(1) Smallpox	—	—	—	—	—	—	—	—	—	—	—	—	—
(2) Diphtheria and membranous croup	—	1·30	0·58	0·19	—	—	0·03	—	0·04	—	—	—	0·15
(3) Enteric fever	—	0·07	—	—	0·07	0·07	0·05	—	0·07	—	—	—	0·04
(4) Typhus fever	—	—	—	—	—	—	—	—	—	—	—	—	—
(5) Scarlet fever	0·33	0·72	0·24	0·11	—	0·04	—	—	—	—	0·12	—	0·08
(6) Cerebro-spinal fever	0·33	—	0·05	—	0·03	—	0·03	—	—	—	—	—	0·01
(7) Measles	5·35	2·02	0·10	—	—	—	—	—	—	—	—	—	0·19
(8) Whooping cough	4·35	1·37	0·10	—	—	—	—	—	—	—	—	—	0·14
(9) Diarrhœa and enteritis	10·37	0·94	0·24	0·04	0·03	0·18	0·05	0·19	0·17	0·30	0·98	0·30	0·33
(10) Other digestive diseases	5·02	0·07	0·24	0·26	0·20	0·18	0·27	0·45	0·53	1·18	1·59	3·03	0·48
(11) Puerperal fever	—	—	—	—	0·07	—	0·08	0·16	—	—	—	—	0·06
(12) Erysipelas	0·33	—	—	—	0·03	—	—	—	0·04	0·12	0·61	0·86	0·01
(13) Other septic diseases	—	0·29	0·14	—	0·10	—	0·13	0·03	0·04	0·59	0·12	—	0·09
(14) Phthisis (pulmonary)	0·33	1·01	0·29	0·34	1·06	1·28	1·28	0·80	0·77	—	—	—	0·78
(15) Tuberculous meningitis	3·35	0·72	0·10	0·04	—	—	—	—	—	—	—	—	0·11
(16) Abdominal tuberculosis	0·67	0·07	0·24	0·15	0·13	—	0·03	0·16	0·04	—	—	—	0·13
(17) Other tuberculous diseases	—	—	0·19	0·04	0·13	0·11	0·08	0·06	0·07	0·12	0·24	—	0·10
(18) Cancer (malignant disease)	—	—	—	—	—	—	0·27	1·07	2·21	5·91	8·67	9·51	1·22
(19) Rheumatic fever	—	—	—	0·04	0·03	—	—	—	—	—	—	—	0·01
(20) Meningitis (not tuberculous)	3·35	0·72	0·19	—	0·07	—	0·05	0·06	0·04	—	—	—	0·12
(21) Cerebral hæmorrhage	0·67	—	—	—	0·03	—	0·22	0·26	0·56	2·42	6·47	12·11	0·61
(22) Other diseases of nervous system	4·35	0·72	0·24	0·07	0·07	0·26	0·49	0·19	0·21	0·89	3·30	6·92	0·46
(23) Circulatory diseases	0·67	0·07	0·38	0·41	0·23	0·44	0·30	0·96	1·69	3·42	8·79	22·05	1·28
(24) Pneumonia	15·07	2·24	0·05	0·19	0·10	0·07	0·03	0·48	0·46	1·77	3·54	7·35	0·85
(25) Bronchitis	7·04	0·51	0·05	—	0·13	0·07	0·08	0·06	0·70	2·30	7·94	18·59	0·83
(26) Other respiratory diseases	1·67	0·22	—	0·11	0·03	0·04	—	0·10	0·14	0·47	0·97	3·46	0·18
(27) Croup	—	0·22	—	—	—	—	—	—	—	—	—	0·43	0·02
(28) Influenza	0·33	0·07	0·38	0·08	0·13	—	0·03	0·03	0·07	0·30	0·37	2·16	0·08
(29) Violence	1·00	0·29	—	—	—	0·11	—	0·19	0·25	0·24	0·12	1·73	0·19
(30) Premature births	14·39	—	—	—	—	—	—	—	—	—	—	—	0·17
(31) Unknown	—	—	0·05	—	—	—	0·03	—	—	0·06	0·12	—	0·02
(32) All others	21·77	1·16	0·19	0·26	0·20	0·55	0·79	1·68	2·07	4·90	11·11	57·93	2·28
All causes	101·07	14·80	4·04	2·33	2·87	3·40	4·32	6·93	10·17	24·99	54·46	147·43	11·02
Deaths	302	205	84	62	87	93	159	216	289	423	446	341	2,707
Census population (× 9)	2,988	18,845	20,844	26,588	30,219	27,297	36,897	31,122	28,428	16,985	8,190	2,313	245,601

TABLE IX.—1909-1912. FEMALES—FOUR-APARTMENT HOUSES AND UPWARDS. DEATH-RATES PER 1,000 FROM SEVERAL CAUSES AT VARIOUS AGE PERIODS.

Cause of death	AGE												All ages
	−1	−5	−10	−15	−20	−25	−35	−45	−55	−65	−75	75+	
(1) Smallpox	—	1·13	0·60	0·29	—	—	—	—	—	—	—	—	0·08
(2) Diphtheria and membranous croup	—	—	0·10	—	0·04	—	0·05	—	—	0·06	—	—	0·04
(3) Enteric fever	—	—	—	—	—	0·03	—	0·07	—	—	—	0·29	—
(4) Typhus fever	—	—	—	—	—	—	—	—	—	—	—	—	—
(5) Scarlet fever	—	0·32	0·10	0·15	—	0·03	—	0·03	—	—	—	—	0·03
(6) Cerebro-spinal fever	0·73	1·62	0·40	—	—	—	—	0·03	—	—	—	—	0·00
(7) Measles	2·19	0·49	—	—	—	—	—	—	—	—	—	—	0·07
(8) Whooping cough	7·29	0·49	—	0·07	—	—	—	—	—	—	—	—	0·03
(9) Diarrhoea and enteritis	3·65	0·16	0·40	0·07	—	0·03	0·16	0·03	—	0·06	0·59	1·75	0·13
(10) Other digestive diseases	—	—	—	—	0·12	0·23	0·02	0·40	0·29	0·77	1·67	5·24	0·44
(11) Puerperal fever	—	—	—	—	0·04	0·03	—	0·10	—	—	—	—	0·03
(12) Erysipelas	—	—	—	—	—	—	—	0·03	0·04	0·22	—	0·29	0·03
(13) Other septic diseases	—	—	0·20	—	—	0·03	—	0·03	—	0·06	0·10	0·29	0·03
(14) Phthisis (pulmonary)	—	1·13	0·30	0·07	0·48	0·49	0·66	0·80	0·51	0·39	—	0·29	0·49
(15) Tuberculous meningitis	3·65	—	—	—	—	—	0·02	0·07	0·04	—	—	—	0·08
(16) Abdominal tuberculosis	1·46	0·32	—	0·07	0·04	—	0·05	0·10	—	—	—	—	0·05
(17) Other tuberculous diseases	—	—	—	—	0·08	0·10	0·05	0·07	0·11	0·06	0·10	—	0·07
(18) Cancer (malignant disease)	—	—	—	—	0·08	0·03	0·18	0·66	1·76	3·58	6·49	10·48	1·11
(19) Rheumatic fever	—	—	—	—	—	—	—	0·07	—	—	—	—	0·01
(20) Meningitis (not tuberculous)	2·19	0·65	0·10	0·07	—	—	0·02	—	—	—	—	—	0·05
(21) Cerebral haemorrhage	3·65	0·16	—	0·15	—	—	—	0·13	0·55	1·99	4·33	10·18	0·61
(22) Other diseases of nervous system	1·46	—	0·20	0·22	—	0·10	0·05	0·13	0·40	1·27	2·85	6·11	0·46
(23) Circulatory diseases	4·38	—	0·20	0·07	0·28	0·37	0·52	0·70	0·99	3·86	8·55	21·83	1·45
(24) Pneumonia	4·38	0·97	—	—	—	0·03	0·13	0·16	0·70	1·38	1·87	6·11	0·50
(25) Bronchitis	1·46	0·49	—	—	—	—	—	0·03	0·37	0·77	3·14	14·85	0·53
(26) Other respiratory diseases	0·73	—	—	—	—	—	0·07	0·07	0·29	0·28	0·88	3·49	0·19
(27) Croup	—	—	—	—	—	—	—	—	—	—	—	—	0·00
(28) Influenza	—	0·16	0·10	0·07	—	—	—	0·07	0·18	0·06	0·69	0·58	0·08
(29) Violence	—	—	—	—	0·08	0·03	0·13	0·03	0·04	0·22	0·59	2·62	0·15
(30) Premature births	20·41	—	—	—	—	—	—	—	—	—	—	—	0·13
(31) Unknown	0·73	0·16	—	—	0·04	—	—	—	0·04	—	—	—	0·02
(32) All others	14·59	1·62	0·40	0·15	0·36	0·33	0·47	1·09	1·72	3·36	8·16	60·54	2·30
All causes	72·95	9·87	3·10	1·45	1·64	1·86	2·58	4·90	8·03	17·89	40·01	145·26	9·19
Deaths	100	61	31	20	41	57	114	148	219	324	407	499	2,021
Census population (× 3)	1,371	6,183	10,044	13,683	24,780	30,444	44,244	30,177	27,279	18,114	10,173	3,435	219,927

TABLE X.—1909-1912.   FEMALES—INSTITUTIONS AND HARBOUR.   DEATH-RATES PER 1,000 FROM SEVERAL CAUSES AT VARIOUS AGE PERIODS.

Cause of death	Age												All ages
	-1	-5	-10	-15	-20	-25	-35	-45	-55	-65	-75	75+	
(1) Smallpox	—	—	—	—	—	—	—	—	—	—	—	—	0·04
(2) Diphtheria and membranous croup	—	0·83	—	—	0·54	—	—	—	—	—	—	—	0·22
(3) Enteric fever	—	—	—	—	—	—	0·67	0·44	—	—	—	—	0·30
(4) Typhus fever	—	—	—	—	—	—	—	—	—	—	—	—	—
(5) Scarlet fever	—	3·33	0·60	—	—	0·59	—	—	—	—	—	—	0·04
(6) Cerebro-spinal fever	—	—	0·60	—	—	—	—	—	—	—	—	—	0·61
(7) Measles	—	11·67	—	—	—	—	—	—	—	—	—	—	0·04
(8) Whooping cough	104·42	0·83	—	—	—	—	—	—	—	—	—	—	1·77
(9) Diarrhœa and enteritis	12·05	9·17	—	—	—	0·30	0·22	0·44	—	—	3·01	2·15	0·78
(10) Other digestive diseases	—	0·83	—	—	0·54	0·30	0·22	0·87	1·05	0·58	—	1·08	0·04
(11) Puerperal fever	—	—	—	—	—	—	—	—	—	—	—	—	—
(12) Erysipelas	—	—	—	—	—	—	—	—	—	—	—	—	—
(13) Other septic diseases	—	—	—	—	—	—	—	0·44	1·05	1·15	—	—	0·22
(14) Phthisis (pulmonary)	—	—	1·19	1·12	5·95	5·05	5·14	17·90	10·55	10·40	7·84	—	6·36
(15) Tuberculous meningitis	24·09	1·67	—	0·56	—	—	0·22	0·44	—	—	—	—	0·48
(16) Abdominal tuberculosis	—	0·83	1·19	—	—	—	—	—	—	—	—	—	0·13
(17) Other tuberculous diseases	24·09	10·83	3·58	1·67	1·08	—	0·45	—	—	—	—	—	1·38
(18) Cancer (malignant disease)	—	—	—	—	—	—	0·45	2·62	3·69	6·93	10·25	8·60	2·25
(19) Rheumatic fever	—	—	—	—	—	—	—	—	—	—	—	—	—
(20) Meningitis (not tuberculous)	—	—	—	—	—	—	—	—	—	—	—	—	—
(21) Cerebral hemorrhage	—	—	—	—	—	—	0·22	0·87	2·11	10·98	21·70	17·20	3·37
(22) Other diseases of nervous system	4·02	—	—	—	2·16	—	0·45	0·87	3·16	2·89	3·62	5·38	1·17
(23) Circulatory diseases	4·02	—	—	0·56	—	0·59	0·67	2·62	10·55	20·80	58·65	93·55	10·69
(24) Pneumonia	8·03	8·33	—	1·67	—	—	0·45	1·31	1·58	5·20	9·64	5·38	1·95
(25) Bronchitis	16·06	—	—	—	—	—	0·22	0·44	5·27	6·93	19·89	24·73	4·07
(26) Other respiratory diseases	—	—	—	—	—	—	—	0·44	—	1·15	1·81	1·08	0·30
(27) Croup	4·02	—	—	—	—	—	—	—	—	—	—	—	0·04
(28) Influenza	—	—	—	—	—	—	—	—	—	0·58	—	—	0·04
(29) Violence	—	—	0·60	—	—	0·30	—	0·44	1·05	1·73	1·20	3·22	0·56
(30) Premature births	68·27	—	—	—	—	—	—	—	—	—	—	—	0·74
(31) Unknown	8·03	—	—	—	—	—	—	0·44	—	0·58	1·20	—	0·26
(32) All others	88·35	3·33	1·79	2·79	2·16	0·59	0·67	1·75	8·45	12·71	25·92	51·61	7·62
All causes	365·45	51·65	9·55	8·97	12·43	7·72	10·05	32·33	48·51	82·61	159·78	218·98	45·47
Deaths	91	62	16	15	23	26	45	74	92	148	265	199	1,051
Census population (× 3)	249	1,200	1,674	1,791	1,848	3,366	4,479	2,289	1,896	1,781	1,659	980	23,112
City (all females)	131·26	26·77	5·10	2·95	3·44	4·25	5·57	9·20	15·31	29·77	60·68	133·51	15·61
Deaths	3,628	2,797	624	340	899	508	1,172	1,442	1,748	2,091	2,463	1,675	18,882
Census population (× 3)	27,639	104,502	122,288	115,302	115,980	119,592	210,983	156,720	118,841	70,248	40,590	12,546	1,209,576

TABLE XI.—GLASGOW : TOTAL DEATHS, OCTOBER, 1909, TO SEPTEMBER, 1912.

Houses			Males		Females		Total
1 apartment ...	...	...	3,969	...	4,192	...	8,161
2 apartments ...	...	...	9,376	...	8,911	...	18,287
3 ,.	..	...	2,808	...	2,707	...	5,515
4 ,, and upwards		...	2,098	..	2,021	...	4,119
Institutions and harbour		...	1,891	..	1,051	...	2,942
Total	...	...	**20,142**		**18,882**		**39,024**

physical handicap, which I have endeavoured to illustrate by the difference in the rate of prematurity in the various types of houses. These differences are, I think, to some extent related to the food supply. I have suggested that the handicap is not extinguished by the high rate from prematurity, but may be traced in the disorders of digestion associated with low innervation and in the diseases of early life associated with an unstable nervous system. In later life the influences of the birth surroundings do not, I suppose, wholly disappear, but they are obscured by those which operate on adult life, and, as we have seen, diseases of the nervous system tend to become degenerative in type and appear more frequently among the occupants of houses of larger size.

In this review of the tables I cannot claim to have exhausted the suggestions which they contain. The varying incidence of fatal phthisis for example in the different classes of house suggests a wave of prevalence which has two crests, not always synchronizing as to age-periods, but with a tendency toward postponement of the earlier one as the external surroundings improve. They have associated themselves in my mind with the difference in age-incidence which might be assumed to arise in the earlier ages from an inherited bias and in the later ages from external conditions producing anew a susceptibility to the disease.

In any case the analysis may serve to emphasize the need for carrying inquiry beyond the falling death-rate at all ages to a discrimination of the age-periods at which it principally occurs. It may incidentally also serve to suggest that the whole economic condition of the poor among our population, and not their housing only, is a subject of national importance.

DISCUSSION.

The PRESIDENT (Dr. W. H. Hamer) said the subject dealt with in the paper was an exceedingly interesting one ; indeed, if any evidence of this were required, it was to be found in the extraordinary changes in attitude of mind towards it which had prevailed at various times.   Nearly two thousand years ago an eminent biometrician, the poet Horace, had said, " Pallida mors. . . . ."—the passage was familiar and he need not quote it, but might paraphrase it thus—the death-rate in one-apartment houses is very much the same as that in houses of four apartments and upwards.   That view prevailed for years.   Then came the Registrar-General, and people began to believe that the kind of house in which one lived really had some influence on one's health. During the last few years, however, students of the subject had been hearing a great deal of criticism of the view last mentioned.   Some of the members of that Section had recently been attending a course of lectures at University College, and there they had been urged to believe that environment had no influence whatever, and that the only thing which could be done to make life worth living was to try to improve the health and the habits of our parents. Then at length came Dr. Chalmers, and brought them down to earth again ; it was delightful to find after all that the views upon which they had all been brought up really had something in them.   As Sir Shirley Murphy had dealt with this subject in his Presidential Address at York, he hoped he would be prepared to initiate the discussion.

Sir SHIRLEY MURPHY said that it was only by a careful analysis of the causes of death that one could hope to arrive at any final explanation of the differences in the death-rates of various populations in different social conditions.   He discussed the subject in his address at York, and he thought that the difference in death-rate was probably one of social condition, and that it was a matter of less power of resistance to disease in the case of the poor as compared with the better-to-do.   When he read his paper he did not know of Dr. Snow's paper, and as Dr. Snow was present he hoped he would give the meeting his side of the story, because his work had been very thorough, and his views would be attentively listened to.   If the whole question were one of resistance to disease, it might be manifested in disease of various sorts ; and Dr. Chalmers had found that in regard to each of the groups of diseases which he had taken, except cancer, the tendency to disease mortality did follow the social condition.   He was particularly struck by Dr. Chalmers's method of classification of deaths by ages. The reports of the Medical Officer to the London County Council—he took Dr. Hamer's figures—showed that the differential mortality of populations in different social condition was less manifest immediately after birth—i.e., in populations where there was a large proportion of the poor one did not find that the infant mortality under one week differed

so widely in the poor from that which obtained among the more fortunately placed as it did in subsequent weeks of life, and with each increment of age the difference became more pronounced. He did not know whether the question of food could be held to enter widely into that, because the presumption was that certainly in the first two or three weeks of life the baby was at the mother's breast; and unless it could be assumed that the milk of the poor mothers provided for the child less nutriment than that of the rich, he would still be disposed to say that the question was largely one of resistance to disease. He hoped the meeting would be favoured with the views of Dr. Snow.

Dr. E. C. SNOW did not consider his work deserved the kind things which had been said of it, but he would remind the meeting of the chief points of the papers referred to. It was a matter of some controversy, and possibly Mr. Major Greenwood would say something on the other side. The subject of his inquiry was the Darwinian question of natural selection, and he attacked it in the following manner. If one took, say, thirty or fifty distinct populations of babies born in the same year, and followed them through life for five years or ten years, some of them would be found to have a heavy mortality in their first two or three years, other populations a light one. If they were all placed in similar environment, would those baby populations which suffered from a heavy mortality in the first two or three years of life show a light mortality in the later of the series of years? He could not discuss the statistical difficulties of the problem, but he found there was a distinct negative correlation between the mortality in the first two or three years of life and the mortality in the later years. The negative correlation was not large for English districts, but was considerable for Prussian districts. On the average those cohorts of Prussian babies which had one hundred deaths in excess in the first three years, had eighty or ninety deaths in defect in the next seven years. From the evidence he brought forward he drew the conclusion that a considerable proportion of the mortality in infancy was selective, and that those districts with a heavy infantile mortality suffer in later years to a smaller extent than they would if the infantile mortality were lower, and vice versa. The death-rate tables in the present paper he regarded as highly interesting. The first question which it occurred to him to ask when he noticed the different mortalities of the male adult occupants of one-, two-, and three-apartment houses, was with regard to the occupations of these adults. Were the occupations of the inhabitants of the one-, two-, and three-apartment tenements sensibly the same? Was the increased death-rate evidenced in the smaller tenements solely due to the kind of house, or was it merely *associated* with the kind of house, but produced by other causes, such as occupation and habits? He thought the latter to be quite possible. The paper was so thorough in other respects that he felt sorry that the information about occupation was not given. It would be seen that at ages 20 to 25, and 25 to 35, the male death-rate in one-apartment tenements was less than the corresponding one in the two-apartments. But the reverse was the case with females. He did not know whether these differences were significant, but

they suggested a difficulty in that the males at those periods of their lives might have gone to institutions to die rather than dying in their own homes. Having being concerned with mortality statistics in connexion with Friendly Societies, he found that though occupation seemed to influence mortality to a less extent than it influenced sickness, the differences produced by occupation were considerable, and he hoped there would be more information forthcoming as to the occupations of the people dealt with in Dr. Chalmers's tables. He would also repeat that though differences in mortality might appear to be *associated* with particular types of tenement it was inadvisable, without further evidence, to assume that the latter was the *cause* of the former.

Dr. DUDFIELD regretted that so short a time had been available for the study of Dr. Chalmers's paper before the meeting, the more so as he (the speaker) had some work in hand on somewhat similar lines. In considering the mortality in apartment houses (*anglice*, tenements) it had to be borne in mind that among the working-classes a man when he married usually began with a home of one or two rooms, and remained there as long as his wages remained comparatively low, or until the sanitary authority required him to move to a larger tenement on account of overcrowding. By that time the children had passed through the most hazardous ages and the more weakly had been weeded out. Usually there followed more prosperous times for the family when the children began to work and added their contributions to the family budget; to be followed, in later years, as the children left the family, by a period of financial depression when the parents returned once again to the smaller tenement. It was evident, therefore, that the problem of tenement mortality was one of great complexity and, for himself, he could not at present see how the problem was to be solved. Dr. Chalmers had given them the numbers of institutional deaths and certain rates based thereon, but, so far as he (the speaker) could gather, had not attempted to allocate the institutional deaths in the manner usual in England. He should like to know whether such allocation was impossible for any reason in Scotland, because the mortality-rates in each class of tenement might be expected to be materially altered if the institutional deaths were properly allocated. He could wish that there were in England similar facilities for studying tenement mortality as there appeared to be in Scotland. If he desired to get out rates such as those presented by the author, it would be necessary to visit every family and house in which a death occurred. He entertained some hope of being able to study the matter in a somewhat similar, but not so exact, manner by comparing the mortality in individual streets, the general characters of which, *qua* housing, were known.

Dr. BASHFORD said that the point in which he was specially interested was the comparison the author brought out between the incidence of cancer in one, two, three, and four-roomed houses, and the incidence of malignant disease generally. As members of the Section knew, that subject had been brought out fully by Sir Shirley Murphy in his reports for 1906 and onwards,

and these figures had been confirmed by those for Stuttgart by Weinberg, Berlin by Hirschberg and Silbergleit, Vienna, by Rosenfeld. No relationship had been established between the incidence of cancer and the degree of congestion of living apartments. There was in this respect a marked contrast between cancer and tuberculosis. One would hardly expect to find in populations inhabiting small houses a large amount of cancer, seeing that this was a disease affecting largely the higher age-groups, and one, two, and three-roomed houses contained a high proportion of children. Furthermore, although persons inhabiting such houses often took in aged dependents, the latter, in case of severe illness, almost always drifted into institutions, and therefore the allocation of deaths demanded as great attention as did the age and sex distribution. He noticed that Dr. Chalmers said in his paper that there was no definite relation to be established between the number of rooms inhabited and the incidence of cancer. But on looking at the tables, if one took No. 31, "unknown causes of death," and No. 32, "all other causes of death," or the deaths grouped together as in No. 10—namely, "digestive diseases"—one found also, as the number of rooms increased, a diminishing proportion of cases was allocated to these different diseases. That might also have some bearing on the interpretation of the figures implying merely improving degrees of certification of causes of death. Considering that in the past all cases of cancer were lumped together, as if it were one disease, which it was known now not to be, but to present many varieties, one could understand the generalizations which were made. If statistics of cancer were to continue to advance our knowledge not only must the age and sex distribution be taken account of as in the past, but also the primary sites stated. Dr. Ogle had attempted to tabulate cancer according to the certain selected sites affected, but gave it up as he did not think the expense and labour justified, being unable to see much good result. At a later date the subject was taken up in different ways, and he (Dr. Bashford) had urged its importance as the result of comparative studies on animals and the age-incidence of cancer on organs as distinct from individuals. Sir Shirley Murphy, in taking up the question of density of population for London, had attempted to tabulate carcinoma as distinct from sarcoma. That was arbitrary, as no difference clinically existed, so far as certificates of death were concerned. But, with the backing of the Imperial Cancer Research Fund, the Registrar General's Office had been invited to publish detailed information as to primary sites, which was available for ten years, and the result had been to show that, as had been long recognized, the age and sex were of great importance; but the figures established a new fact, that while the influence of age was similar or identical for the same organs in the two sexes it differed widely from one organ to another. In the tables which Dr. Stevenson published one had the maxima for different organs at certain age-periods; for some sites there was one maximum immediately after birth, and another towards the end of life. For some organs there was only one maximum attained; probably towards the end of natural life. In other sites, the incidence went on increasing progressively, or there might be the suggestion

of two waves.   The progressive increase, or the apparent drop, might or might not be right ; nevertheless, the differences brought out were real differences for all sites, owing to the imperfect certification of cause of death in the aged. It was known that deaths recorded as from old age, 0˙65 in 1909 per 1,000, were equal in number to the deaths recorded from cancer in that year. Thus there was a large margin of error, and many deaths set down to old-age were almost certainly due to cancer.   Therefore there did not seem much scope for statistical investigation in regard to the incidence of cancer in different houses.   But an important point was that which had been raised as to occupations and the allocation of deaths in institutions.   Dr. Chalmers gave the deaths per 1,000 from several causes at various age-periods; he presumed that was deaths per 1,000 persons living at those ages, and the other deaths per 1,000 at various institutions.   There was, then, no attempt to compare selected populations in these institutions with the general population.

Dr. CHALMERS interposed to explain that his institutional deaths were not the Registrar General's.   In Glasgow they returned to the house address, when there was one, every death occurring in an institution.   But there were 23,000 people who lived either in Poor Law institutions or in common lodging-houses, or in homes for old people, &c., &c.; they were persons who had no address other than that of the institution in which they lived.   The number of deaths of these persons was 3,939 in the period under review.

Dr. BASHFORD, continuing, said his other point was that statistical effort might usefully be diverted to some other aspect of this subject, because of the large amount of experimental work which had been done; the problem was not only a statistical but also an experimental one.   For twelve years a large number of experiments had been performed, with the view to ascertaining whether there existed anything in the nature of cancer houses or a population specially invaded with cancer.   Part of that investigation consisted of breeding experiments, partly of housing healthy animals along with animals in which the disease had been inoculated.   Hundreds of thousands of experiments had been performed on the housing side, but they had never seen a higher spontaneous development of the disease among such animals in comparison with that in animals isolated from the inoculated ones.   They had been able to breed a strain of mice in which, at every age-period, the disease was much more frequent than in other strains—at some age-periods almost twice as frequent.   And they had housed old animals with young animals for long periods, yet neither in old nor young had any higher incidence been observed, not even in the offspring of mothers already cancerous.   The statistics of Sir Shirley Murphy on the matter, because of the allocation of deaths occurring in institutions, were the most reliable which had been published, and the experiments bore out the results of Sir Shirley's statistics in regard to cancer.

Dr. FREMANTLE said he yielded to none in his admiration of the very laborious and interesting compilations which had been set forth in the paper. The discussion had given promise of further work to be done, and he suggested that in regard to these housing questions care should be taken to see that efforts were usefully employed. Whether one was inquiring into the influence of the size of the house, or of the back-to-back house, or problems of sanitation, one could not resist the fact that the problem was a complex one, the causes were multiple, and gross conclusions could not be formed as to one factor alone. In this case the issue, as regards healthiness of the house, was confused by differences of overcrowding, of comparative ages, and of comparative wealth, a matter which must have occurred to the minds of many. This latter was a most important matter in any investigation of the kind ; and the average rate of wages must be taken into account. Generalizations based upon other data were likely to be love's labour lost. It was because he so highly looked forward to Dr. Chalmers's future labours in connexion with housing that he insisted on this point. An instance in illustration was raised by Dr. Bashford when he spoke of the incidence of malignant disease. Dr. Chalmers gave that as an exception to his rule ; but might it not be— seeing that Dr. Bashford had shown that many differences in cancer-rates might be due to differences in diagnosis—that those who lived in four-room tenements were better attended medically than were those who lived in one room ? A careful consideration and tabulation was necessary of all the conditions, including that of wealth, before the comparison of housing conditions could be advanced by comparison of death-rates.

Dr. FARRAR pointed out that in many districts, such as those of the mining and cotton industries, where the average wage was good, the general and infantile death-rates compared unfavourably with those where less money was earned. And it was notorious that during the cotton famine the infantile death-rate was much reduced in the districts affected. Therefore the relationship of dietary and wages to death-rate was not quite obvious.

Mr. MAJOR GREENWOOD said he had not seen the paper until that evening, and it was scarcely fair to criticize after a few minutes' acquaintance a paper which had obviously involved many months' labour. With regard to the controversy as to environment versus selection, he submitted that much of the dispute simply arose from the natural desire of human beings to quarrel with each other. In this paper differences between the rates of mortality in different classes of house were shown. The man in the street tended to jump to the conclusion that the differences in housing was the cause of the difference in mortality, that the obvious explanation was the true explanation. The obvious explanation need not be the true explanation ; but still, because an explanation was obvious, it need not be false. He (Mr. Greenwood) thought that there was in some quarters a tendency to assume that when a difference could be plausibly referred to inherited characteristics it needed no further analysis, but that only

when the apparent explanation was environmental further analysis was necessary.   Professor Pearson had shown that the differences in the infantile mortality rates of families of bad habits or health when compared with persons of good habits or health, irrespective of housing conditions, were greater than the general differences between the rates for all families in "through" and all families in "back-to-back" houses, but a difficulty he (Mr. Greenwood) felt was as to whether the people with bad habits went to the back-to-back houses because they had bad habits, or as to how far living in back-to-back houses produced bad habits.   He did not think that question had been satisfactorily answered.   But with regard to testing how far any effect was environmental and how far it was selective, he could see no other process than that of Dr. Snow ; and Dr. Snow was mistaken in supposing he differed from his view.   Such difference as there might be between himself and Dr. Snow was as to whether one could neutralize the environmental factor by operations performed on mortality figures alone. He agreed with Dr. Snow that one could not judge as to whether the influence of environment was important simply by showing that one got the same difference between the rate of mortality in the infants in the different classes of house as in the case of children aged 1 to 5, because there one was comparing contemporaneous populations.   It was clearly necessary to do as Dr. Snow suggested—namely, to take a certain number of children living under certain conditions, of all ages, and then to follow the survivors after infantile age through life, and to compare their mortality from age to age with that of a similar set under other conditions.   That seemed a very difficult investigation to carry out, owing to the migration continually going on from one stratum to another.   Owing to the imperfections of the statistics, more attention should perhaps be paid to the positive than to the negative results, but here difficulties might arise.   In Dr. Snow's valuable paper, for instance, it might be difficult for a reader to be clear why one should pay more attention to a set of data which gave a high negative correlation, than to another set which gave a low one ; and the suspicion arose in the mind that it was very easy in these complicated statistics to convince oneself that the statistics which yielded the result which accorded with one's a priori ideas were the more accurate ones.   He did not suggest for a moment that that was the case in Dr. Snow's paper, for Dr. Snow gave reasons which could be weighed for his preference ; but it was necessary for other people to be on their guard against falling into such a trap.   Dr. Bashford had alluded to the question of cancer, and the great fallacies which arose owing to errors and ambiguities in the statistics.   Mr. Maynard had recently published an interesting paper which exhibited a high correlation between the death-rate from diabetes and the death-rate from cancer in American cities.   Mr. Maynard gave some general reasons, which were not perhaps very definite, for thinking there should be a correlation between these different diseases.   He (Mr. Greenwood) found that if one applied the same process to other countries, sometimes one got the same results as Mr. Maynard, and sometimes different results ; and

one was conscious of a tendency to suppose, if one agreed with Mr. Maynard's general views, that where the statistical results which supported it were obtained the cancer statistics were better than they were in other countries which gave negative results. In all these investigations it was best to adopt the President's attitude of resolute scepticism.

The PRESIDENT remarked that Dr. Dudfield had made the point as to the allocation of deaths in institutions to the different classes of houses. Dr. Chalmers had spoken of the ebb and flow of the population as between one class of population and any other. Taking the city as a whole, Dr. Chalmers had informed him that there was a loss of 80,000 persons during the last ten years. No one knew how many deaths had occurred among those 80,000, but if in addition to the other allocations mentioned by Dr. Dudfield, it had been possible to allocate to the several class groups the deaths among the 80,000, still further differences would have resulted, and possibly some of those anomalies which had been referred to as occurring at the higher age-periods would thus have been accounted for. In looking through the returns of London deaths, and comparing the later years mentioned by Dr. Chalmers with the earlier year 1901, it transpired that the higher number in the earlier periods compared with the later were, first, in diarrhœa—and that, no doubt, followed from the fact that in the three later years there were exceptionally wet summers—and then, further, the other excessive numbers found were in phthisis, bronchitis, and diseases of the nervous and digestive systems. Under all those headings (with the exception of diarrhœa) deaths at older ages were higher than those at younger ages. If, then, some of the deaths among the 80,000 persons leaving Glasgow could have been referred back to the different groups of houses, they might have tended to raise those death-rates at the later periods in the one-apartment and two-apartment houses which Dr. Chalmers had told them were lower than might perhaps have been expected.

Dr. CHALMERS, in reply, said it had been pointed out to him, in a friendly way, that he had not published his conclusions until after the meeting. He had enjoyed the criticisms, which had to some extent suggested new lines of inquiry. He had used the house-grouping because it seemed to him to represent in a rough way the economic grouping; house rentals or even income-tax returns might also have been used for a similar purpose. What he wanted to present was the relationship of two things which had a common association in the house—viz., the occupants and the deaths occurring among them. That was one reason why he had tried to place the death-rates according to house groupings. He had hoped to get comparative tables of occupation and income, but one of the difficulties was the selection of proper samples. He had taken the occupations of 3,400 families selected from seventeen of the industrial wards; but owing to lack of time it was impossible to bring the analysis beyond the twenty-three primary groups of the Registrar-General's classification. At some future time he might be able to bring the facts of the average incomes associated with the occupations followed by the

inhabitants of the different sizes of house into line with the death-rates. That had not been overlooked, but it could not be accomplished in time. He had begun the inquiry with the view of ascertaining the changes in the death-rates of particular social groupings between 1901 and 1911. The death-rate was not that of the decennium, but the death-rate around census periods. The personnel was continually changing, people were frequently moving from one part of the city to another, and he thought also from one size of house to another. It would be a difficult matter to follow the life-history of each family in any considerable number of cases in such a way as to trace a continuous life record. What seemed to him to require investigation was the change in the social incidence of particular types of disease as age advanced. Dr. Bashford disagreed with his remarks about cancer because he found a similar disparity in looking over the figures for indigestion and for diseases of the nervous system. He (the speaker), following up the suggestion of low vitality at birth in the children of the smaller-sized houses, as shown in the death-rate from "prematurity," was inclined to regard the change in the house-incidence of these two groups of disease, associated as it was in after years with a change in type among the diseases of the nervous system from convulsive to degenerative forms, as evidence that the birth-handicap continued during adolescence at least. It seemed to be extinguished thereafter, or to become obscured by the influences affecting adult life. He had read Dr. Snow's paper, and agreed to some extent in thinking that in certain conditions diseases were selective. That, indeed, was the purpose of his own suggestions in the illustrations he used regarding prematurity and diseases of digestion and of the nervous system. He believed they might be regarded as selective diseases—although that might only carry them one stage further back to the inadequate food supply of the mother. There was no evidence that the infectious diseases were selective in this sense. Sir Shirley Murphy made an interesting statement with regard to deaths in the early weeks of life, as being similar in rate for small and larger houses. Two or three years ago, when making another inquiry, what struck him was that if one took the deaths from immaturity, one found that the rate in the different wards of the city differed enormously, but that there was a constant ratio between their volume and the final death-rate under one in the same ward. The ultimate death-rates differed, as the original prematurity rates did, but their relation to "immaturity" appeared to be uniform. With regard to the difficulty as to institutional deaths, mentioned by Dr. Dudfield, that was being got over in Scotland. For years, however, in Glasgow the practice had been to refer back each institutional death to its own house and district; and the deaths of 1911 were quite comparable with those of 1901. He did not think Dr. Farrar's illustration from the cotton famine was on all fours with his own suggestion regarding prematurity; because in the cotton famine it was the difference between children who were nursed and children who were not nursed because their mothers were in employment.

Section of Epidemiology and State Medicine.

April 25, 1913.

Dr. W. H. HAMER, President of the Section, in the Chair.

A Note on Sleeping Sickness in Principe Island and Angola, West Coast of Africa.

By Surgeon McCOWEN, R.N., M.D.

(Contributed by Fleet-Surgeon P. W. BASSETT-SMITH, C.B., R.N.)

H.M.S. " DWARF " visited Principe Island on October 28, 1911, where we remained a couple of days. The island lies 120 miles north-westward from Cape St. John, the nearest part of the coast of Africa, and 116 miles south-westward of Fernando Po island. It is in its physical features and aspect one of the most remarkable islands in the world. It is 9 miles in length, north and south, with an average breadth of 4 miles ; it is in possession of the Portuguese, by whom it was discovered in 1471.

Nearly the whole of the population reside in the town of San Antonio, situated at the head of a bay on the east side of the island. In 1900 the population numbered about 4,327, and consists mostly of natives.

As regards climate, the island is subject to much rain, and the soil is exceedingly prolific ; the luxuriant vegetation, which everywhere abounds, becomes rank to such a degree as to cause the island to be unhealthy. The climate is hot and humid.

Sleeping sickness abounds in Principe, and there have been as many as ten deaths in one day from this cause, and never less than two. According to the medical officer, Dr. Alfredo Salvador, more than half the mortality is caused by sleeping sickness.

M—9

I was fortunate enough to procure a collection of tsetse-flies at Principe. After obtaining the flies at Principe, I lent them to Dr. Carrio Mendes, at St. Paul de Loanda in Angola. Dr. Mendes has written a book in French on the tsetse-fly, and he was good enough to go over my collection. He found them all to be of the *Glossina palpalis* species, which, he said, were the only ones found in Principe, as he had visited that place himself some few years ago. To this collection he kindly added two more—one a variety of palpalis called *Glossina Wellmani*, after an American doctor who discovered it, and another the *Glossina longipalpis*. These three, the *Glossina palpalis*, *Glossina Wellmani*, and *Glossina longipalpis*, are the only three species of tsetse-flies to be found in Angola.

Both in Principe and Angola I saw about thirty-five cases of trypanosomiasis in all stages of advancement, some with adenitis only, some with papular eruptions and œdemas ; others in the final stages of implication of the nervous system, such as languor, fibrillary twitchings of the tongue and hands, and others in the last comatose stage.

As regards the trypanosome, it is first sought for in the blood, and if not found here, in the lymphatic glands or cerebro-spinal fluid. In the last-named place this generally corresponds with the nervous symptoms. Once the nervous symptoms make their appearance, the case is a hopeless one. Besides in such animals as rats, there is no other means yet known of cultivating the *Trypanosoma gambiense* artificially. The metamorphosis of the trypanosome is not yet known, but Dr. Mendes says it must be in the glossina at least fifteen days before it can transmit sleeping sickness. It has been proved beyond doubt that the *Glossina palpalis* transmits the trypanosome to human beings, and the abundance of *Glossina palpalis* at Principe accounts for the great prevalence of that disease there. It is now believed that other varieties of the tsetse besides *palpalis* can transmit sleeping sickness. The latest comes from Dr. Kinghorn, now working in Northern Rhodesia, who has succeeded in transmitting sleeping sickness to monkeys by means of the *Glossina morsitans*.

The main symptom to be found in all the cases I saw was the enlargement of the cervical glands, which also became tender. Besides this there were to be found cases with irregular fever, and sometimes erythema with infiltration and œdema in Europeans. During these stages the trypanosome is only to be found in the blood and the glands on puncture of the latter. When the trypanosomes are found in the spinal fluid, or its toxins reach the cord, the final stage of

nervous symptoms is then reached, that is, (*a*) languor, (*b*) fibrillary twitchings of the tongue and hands, (*c*) comatose state, which may last from four to eight months—then death.

The cases cured are those in whom the trypanosomes or toxins have not reached the spinal fluid, as at the commencement trypanosomes appear in the blood only.

The mortality at Principe, as before referred to, is very great. At St. Paul de Loanda I saw one post-mortem, at which Dr. Mendes demonstrated an extensive meningo-encephalitis with turbidity of the cerebral fluid.

A wet blood preparation was made of a few cases. It has a peculiar granular appearance on microscopical examination, on account of the agglomeration of the corpuscles into heaps and clusters, the usual rouleaux arrangement being absent. Sir Patrick Manson says, "Such a disposition of corpuscles is very significant of trypanosome infection, whether the parasite be found or not, and sometimes aids in doubtful cases."

The two most important means of early diagnosis are the enlarged glands and gland puncture for the trypanosome. Todd, on his expedition up the Gambia, especially emphasized these two points.

Treatment.—Atoxyl is used both in Principe and Angola, and is given as follows: Double injections of 0·6 gr. every ten days, that is, two injections of 0·6 gr. with an interval of one day, and the same procedure ten days afterward. The results are fair. Dr. Mendes at St. Paul de Loanda has tried " 606 " and has got some good results, but Dr. Salvador at Principe informs me that he has not had such good results with " 606," and that after ten days the trypanosomes reappear in the blood. When at Fernando Po island I saw three cases of trypanosomiasis (Europeans) who were undergoing " 606 " treatment, and the medical staff said that they had good results. These three cases at Fernando Po came from mail boats, and were contracted in Angola. It is worthy of note that neither Fernando Po island, just north of Principe, nor St. Thomas island, just south of Principe, have sleeping sickness.

Prophylaxis.—This is based on the carriers—i.e., tsetse-flies. These tsetse-flies prefer damp places, especially where the vegetation is dense, and where there are plenty of wild animals, on whose blood they feed ; all this being offered at Principe. The tsetse generally does not travel very far, but occasionally follows people to great distances. The intelligent natives of Principe have their houses fitted with insect-proof windows and doors, made of a very finely meshed wire gauze, and do not

venture out for pleasure until dusk, when the tsetse is inactive. The telegraph operator, a Sierra Leone native, informed me that he had not ventured out of his house before dusk for six months. The chief place where the tsetse-fly attacks persons is at the back of the neck, and the natives have the useful habit of continually brushing this part of the head with their hands when walking.

Dr. Carrio Mendes was asked by the Portuguese Government to suppress the trypanosomiasis at Principe, but will only undertake to do so on condition that he is given complete control. He thinks that in Principe, if the bush were cut down near the water's edge, it would not be a guarantee of doing away with the sleeping sickness, as the flies may go further inland to the cocoa plantations. His treatment is radical ; he thinks the only way is to kill all the animals, and then clear the whole island of natives and Europeans for one year, when the trypanosomiasis will probably die out. Dr. Salvador tried to get the natives to go imme- diately to hospital when bitten by a tsetse, for atoxyl injection, but the natives show a strong aversion to any treatment, and notwithstanding the efforts of the authorities none present themselves for treatment.

For non-insular places like Angola, the only prophylaxis that can be carried out is that recommended by Todd after his expedition up the Gambia, that is, examination of all natives, and isolation stations for the same. He suggests a special medical staff for this purpose.

Note.—An examination of the collection of tsetse-flies sent by Surgeon McCowen showed that the great majority of the specimens were *Glossina palpalis* and two examples of the variety *Glossina palpalis Wellmani* (Austen). There was also a specimen of *Glossina medicorum* (Austen) in excellent preservation ; as this is new to the district, and is a rare species, it should be recorded. Examples of this fly have been found only in Liberia, the Gold Coast, and Southern Nigeria.— P. W. Bassett-Smith.

The Diphtheria Bacillus and Scarlatinal Infection.

By T. Shadick Higgins, M.D.

THE object of this paper is to record certain facts as to the incidence of the *Bacillus diphtheriæ* in cases of scarlet fever in Birmingham; and, further, to record observations which appear to show a connexion between the presence of this germ and the persistence of scarlatinal infectiousness, with particular reference to the question of return cases. It deals with the association of this bacillus, not with clinical diphtheria, but with scarlet fever.

Attention was directed along these lines by my finding a number of cases of rhinitis associated with the presence of the Loeffler bacillus in the nose amongst those convalescent cases of scarlet fever whose arrival home from the fever hospitals had been followed by the occurrence of return cases of scarlet fever in their households. This raised the question whether the Loeffler infection had any connexion with the occurrence of the return cases of scarlet fever, and it was arranged by Dr. Robertson that I should take swabs from the nose and throat respectively of all cases that showed scarlatinal infectivity subsequently to their discharge from hospital. It was also arranged that all cases of scarlet fever should be similarly swabbed in the city hospitals at the time of their admission to and discharge from hospital.

In February, 1912, I read a paper before the Midland Branch of the Society of Medical Officers of Health [8], in which I gave the results of this investigation up to November, 1911. Since then more work has been done upon the subject, and in venturing to bring the matter before this distinguished Society I have not only recorded this further work, but for the sake of completeness have not hesitated to repeat much of what was then said.

With the exception of the examination of the swabs taken from patients during their stay in hospital, the bacteriological work has been done by Dr. C. J. Lewis in Professor Leith's laboratory at the University of Birmingham. In addition to the routine examination of swabs Dr. Lewis has isolated the diphtheria-like bacilli in more than sixty cultures.

Definitions.

In order to avoid misunderstanding from the use of certain arbitrary terms, I will here give the definitions of some of the expressions which I am using in this paper.

The term " primary case " is to be understood to mean a case of scarlet fever whose return from a fever hospital has been followed by the occurrence in the same house of a further case or cases of that disease beginning within eight weeks of the date of return.

The term " return case " is used for such secondary cases without the assumption being made that they all, without exception, have been necessarily caused by contact with the corresponding primary cases.

Except where it is specially mentioned to the contrary, no return case has been considered or enumerated where the diagnosis of either the primary or secondary case was revised in hospital to " not scarlet fever."

No swabs have been taken from patients who have caused further cases in their households (" recovery cases ") after their release from isolation practised in their own homes.

Scheme of Work.

The work reported in this paper has been devised upon the following plan :—

I. Amongst those cases of scarlet fever which caused return cases on their arrival home from hospital, the percentage which were infected with true *Bacillus diphtheriæ* was determined. The manner in which this was arrived at is given in detail below.

II. For comparison with this result the incidence of the bacillus (expressed as a corresponding percentage) was also determined amongst cases of scarlet fever whose arrival home from hospital was *not* followed by the occurrence of return cases. In addition, the incidence of the bacillus in scarlet fever cases during their stay in hospital was investigated.

III. Lastly, the proportion of normal school children showing the true *Bacillus diphtheriæ* was determined.

For the sake of clearness, I have divided the paper into three sections corresponding to the above three headings, and a fourth section, in which I have made some comments upon the results.

SECTION I.

The bacteriological investigation of patients who had caused return cases was carried on from December 19, 1910, to November 8, 1912, a period of nearly two years (during which time 5,573 cases of scarlet fever were admitted to the city hospitals).[1] The number of return cases which were notified in that time was 485. These occurred in 365 houses, to which 419 primary cases had returned. The difference in these figures is, of course, due to the fact that more than one primary case returned to some houses, and more than one return case occurred in others. A negligible number of these cases ensued upon the return of primary cases from fever hospitals outside the city, the vast majority being connected with cases from the city hospitals.

The primary cases were visited as soon as possible after the occurrence of the return cases, usually one to three days after notification of the return cases, and swabs were taken from the nose and throat respectively. The specimens from the nose were taken by passing the swab as far into each nasal cavity as the rigid rod would pass, and from the throat by rubbing it well on and about the tonsils. When there was otorrhœa a swab was also taken of this discharge.

The swabs were examined by Dr. Lewis, who inoculated tubes of Loeffler's blood-serum in the usual way, and examined the resulting eighteen-hour cultures stained by Neisser's method, and by simple stain (carbol thionin). He reported as "positive" those cultures which presented diphtheroid bacilli showing polar staining with the Neisser stain like Loeffler's bacillus: that is to say, those cultures in which it was not possible to return a negative report as to the presence of *Bacillus diphtheriæ*. In this paper the terms "positive" and "negative" are used in this sense entirely.

I myself took the swabs from all the primary cases (102) before November 8, 1911. After that date I also dealt with the primary cases (88) in the north-west division of the new city, those in the other three divisions (229) being examined and swabbed by Dr. John Dale, Dr. T. W. Beazeley, and Dr. Reginald Green. The results of the swabbing of these cases were as follows:—

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[1] On November 9, 1911, the population of the city was increased by extension from 526,030 to 842,337, and all return cases have been considered which occurred within the old city before that date or within the extended city on or after it.

	Primary cases
Positive swabs from nose only	112
,, ,, ,, ear only	5
,, ,, ,, nose and ear	4
,, ,, ,, throat only	4
,, ,, ,, nose and throat	19
,, ,, ,, nose, throat and ear	1
Total positive	145
Negative swabs only	234
Swabs not taken	40
Total	419

Thus 145 of the 379 primary cases swabbed were positive, or 38 per cent. (Of the 190 cases which I myself swabbed 42 per cent. were positive; and amongst the 229 swabbed by my colleagues 35 per cent.)

It should be mentioned that only in a few instances were the cases which were reported negative subjected to a second swabbing. Had this been done the number of positives would undoubtedly have been higher. Moreover, in about eighty cases amongst those swabbed the throat swabbing was omitted for various reasons.

As I mentioned above, more than one primary case had recently returned to some of the houses furnishing return cases. As in all probability only one primary case in each of these houses had actually infected the return case, it is more useful to give the results in terms of houses where return cases contracted scarlet fever than in terms of individual primary cases. In houses where there was more than one primary case the house is taken as positive if *any* of the primary cases gave a positive swab, and as negative if *none* of them did so. On this basis the results become :—

Number of houses with positive results	136
,, ,, ,, ,, negative results	189
,, ,, ,, where swabs were not taken...	40
Total	365

—that is, one hundred and thirty-six positive out of 325 houses, or 42 per cent.

Besides the cases which were found to be positive when swabbed in this way after causing return cases, there were a number of other primary cases which, though giving a negative result on that occasion, had been found to be positive some time during their stay in hospital: that is to say, the percentage given above (42) is an under-statement of the number of return case houses where a primary case has given positive results at *any* time during or after its stay in hospital. In my former paper I gave results in which every patient who had given

a positive swab in hospital or subsequently was treated as positive. On this basis, up to November 8, 1911, out of eighty-five houses where return cases had occurred, positive primary cases had returned to fifty-eight—i.e., 68 per cent.

It must be admitted that the microscopic identification of Neisser-staining bacilli indistinguishable from Loeffler's bacillus is not sufficient evidence in series such as these upon which to give a percentage representing the proportion of cultures containing the *Bacillus diph-theriæ*. Isolation and testing of the Neisser-positive bacillus is a neces-sary corollary to its discovery in mixed culture, and until this has been done it is not possible definitely to distinguish the *Bacillus diphtheriæ* from diphtheroid bacilli which closely resemble it in being Neisser-positive and in other respects. This has become very clear from Dr. Lewis's work.

Before I published my results up to date in February, 1911, Dr. Lewis had isolated the bacillus which had led to the " positive " report in three of my positive cases, and in each one had obtained a true Loeffler culture which was virulent, killing a guinea-pig within two days of subcutaneous injection, and produced no effect in a similar guinea-pig which had previously been protected by an injection of diphtheria anti-toxin. From this I concluded that it was safe to assume that most of the positive cultures contained the true *Bacillus diphtheriæ*. ˙

As doubt was thrown upon the validity of this assumption, Dr. Lewis kindly agreed to isolate a consecutive series of these positive cultures. Dr. Dale and I were then dealing with return cases in the northern half of the enlarged city, and it was arranged that all the positive cultures which we obtained should be tested in this way. Reckoning by the date of notification of the return cases, the series began on April 6, 1912, and ended, with an interruption of two months in the summer vacation, on October 17. For nearly four months almost all the positive cases from half the city were specially investigated in this way.

The number of positive swabs in this series was thirty. (It must be mentioned that of the thirty, three were from primary cases who were afterwards found not to have had scarlet fever, though the return cases had true scarlatina. These have not been cut out of the series.) Of these thirty Dr. Lewis was able to isolate the Neisser-positive bacillus in twenty-two instances. All these twenty-two diphtheroid organisms he tested in pure culture in sugar and by inoculation into guinea-pigs,

and divided them into two groups—viz., those which were the true *Bacillus diphtheriæ* of Loeffler, and those which were other diphtheroid bacilli. The Loeffler group were identified by their microscopic appearance, their appearance in broth cultures, and by their producing acid in glucose and dextrin media, but not in saccharose. Thirteen of the twenty-two gave these reactions and were inoculated subcutaneously into guinea-pigs (1 c.c. of forty-eight hours' broth). Eleven of the thirteen were fully virulent, killing the animal within a few days with post-mortem signs typical of death from *Bacillus diphtheriæ*. The bacillus was recovered in pure culture from the local lesion in all these cases. In the other two of the thirteen the guinea-pigs developed a swelling at the site of inoculation and showed signs of ill-health, but did not die. It was concluded that these two were also *Bacillus diphtheriæ*, deficient in pathogenicity. All the thirteen cultures were also inoculated into guinea-pigs which had been protected by the injection of diphtheria antitoxin ; in every case they were harmless to such protected animals. The other nine cultures of the twenty-two did not agree with Loeffler's bacillus in culture reactions (and some of them in morphology), and were non-pathogenic to guinea-pigs. They all gave Neisser-positive individuals, which accounted for the appearance in the original mixed cultures that gave rise to the " positive " diagnosis.

Dr. Lewis concluded from these experiments that of the twenty-two " positive " cultures in which the Neisser-positive diphtheroid was isolated at least thirteen contained the true *Bacillus diphtheriæ*—i.e., 60 per cent.

The patients who gave the true *Bacillus diphtheriæ* exhibited the germ at the time of swabbing as follows : In nose only, six cases ; in nose and ear, one case ; in nose and throat, four cases ; in nose, throat and ear, one case ; in throat only, one case.

There appears to be no reason why the positive cultures obtained from primary cases during these particular four months should differ as to the proportion containing the *Bacillus diphtheriæ* from those given by such primary cases throughout the rest of the two years over which this investigation extended, especially as all the cultures were examined by the same observer. On this assumption we arrive at the result that about 60 per cent. of 42 per cent. (about 25 per cent.) of all houses where return cases occurred had received home from hospital a primary case from whom the *Bacillus diphtheriæ* could be recovered.

This figure can to some extent be checked in the following manner : During the four months in which the " positive " bacilli from the

northern half of the city were being isolated and tested we swabbed the primary cases at forty-six houses, and obtained the true *Bacillus diphtheriæ* from twelve of them. This gives a proportion of 26 per cent. of all return case houses, as compared with 25 per cent. obtained by the other method.

<center>SECTION II.</center>

The striking fact that a quarter of this class of infectious scarlet fever convalescents can be shown to be harbouring the true Loeffler bacillus in their nose or throat subsequently to their discharge from the fever hospital is sufficient demonstration that this germ must be fairly common amongst the scarlet fever patients in the Birmingham fever hospitals. In my former paper I quoted the following extracts from the literature bearing upon the prevalence of this germ in scarlet fever.

In 1898, Todd [14] investigated a form of external rhinitis occurring in scarlatinal convalescents which was characterized by redness at the nostrils, passing on to the formation of raw granular surfaces with crust formation and bleeding, and often associated with spottiness of the face and pustules elsewhere, a condition familiar to all who have had to deal with scarlet fever wards. He found fifty-one (or 14 per cent.) of such cases in 365 cases of scarlet fever at the London Fever Hospital, and on taking nasal swabs obtained the bacillus in every one of the fifty-one cases. Several of these were isolated and proved to be virulent Loeffler bacilli, which could be antagonized by diphtheria antitoxin. He obtained the same organism from the secondary pustules.

Williams (1901) [15] did similar work, and obtained this germ from cases of rhinorrhœa and otorrhœa in scarlet fever. In a series of scarlet fever cases he examined all those which showed any rhinorrhœa, however slight, and in fifty-seven (or 40 per cent.) of 141 cases of rhinorrhœa found the Loeffler bacillus in the discharge. In sixty-eight cases of scarlatinal otorrhœa also he found five (or 8 per cent.) with this bacillus. Only a minority of the cultures tested on guinea-pigs were typically virulent.

It appears, then, well established that rhinitis and otitis in scarlet fever are often characterized by the presence of the *Bacillus diphtheriæ* in the discharge.

In regard to the frequency of its presence in uncomplicated cases of scarlet fever, or in cases in general of this disease, the most striking

feature of the results recorded by various observers is the great lack of uniformity that they show.

Garratt and Washbourn (1899) [4] found that amongst 666 cases of scarlet fever admitted to the London Fever Hospital, only eight (or 1·2 per cent.) showed bacilli in the *throat* morphologically resembling the *Bacillus diphtheriæ*. Their virulence was not tested.

W. T. G. Pugh (1902) [10], at the North Eastern Hospital, London, examined the noses and throats of scarlet fever patients on admission. Out of 415 cases uncomplicated by clinical diphtheria seventeen (or 4 per cent.) showed Loeffler bacilli in the throat, and five of these tested on guinea-pigs were all non-virulent. Out of 414 cases uncomplicated by faucial diphtheria or membranous rhinitis, thirty-three (or 8 per cent.) showed the bacilli in the nose, and six of these tested on guinea-pigs were all non-virulent. In wards where post-scarlatinal diphtheria existed he several times found virulent diphtheria bacilli, and also in fibrinous rhinitis occurring during stay in hospital.

Escherich and Schick (1912) [2] state that Sellner found diphtheria bacilli in 2 per cent. of his (103) scarlet fever cases; Soerensen in 16 per cent. of 1,500 cases (of which thirty-two had clinical diphtheria), and Ranke in 53 per cent. of his cases.

The lack of uniformity in the above results makes it appear that the prevalence of this germ in scarlet fever hospitals varies from place to place, and therefore the prevalence of the germ in the Birmingham primary cases should be compared only with the results obtained in the Birmingham hospitals.

During 1911 the scarlet fever patients in the two chief Birmingham fever hospitals, Little Bromwich Hospital and Lodge Road Hospital, were bacteriologically examined on admission and on discharge under the supervision of the Medical Superintendents, Dr. T. W. Beazeley and Dr. H. M. Cargin. At both hospitals the noses and throats of the patients were separately swabbed. The results of this work will be found in my former paper [8]. At Little Bromwich 32·5 per cent. of 1,063 patients were reported positive on admission (24 per cent. in the nose and 14 per cent. in the throat), and 20·7 per cent. (nose only) at the time of discharge. At Lodge Road 23 per cent. of patients were reported positive (nose or throat) on admission, and 49·6 per cent. of all patients at some time or other during their stay in hospital. Unfortunately, these figures were compiled from the results of a number of medical officers working more or less independently, and were not controlled by isolation of the suspicious organisms.

In the above mentioned paper I worked out from the hospital figures certain results which tended to show some connexion between the prevalence of the positive germs and the occurrence of the return cases, but at the same time expressed the view that the evidence was not conclusive. But in view of other evidence which I give below I feel that more definite results might perhaps be obtained if the whole of the bacteriological examinations inside the hospitals and subsequently in the patients' homes were carried out by a single observer, and the results checked by the necessary isolation and testing of the bacilli.

I have since attacked the subject in a different way. Knowing what proportion of patients causing return cases have true *Bacillus diphtheriæ* which can be demonstrated by swabbing I have tried to get corresponding figures for patients who have not caused return cases; my object being to compare the incidence of the true Loeffler bacillus after discharge from hospital in those who remain capable of spreading scarlet fever with the incidence in those who have not shown themselves to be infectious. For this purpose I visited about a hundred cases ten days after their return from the fever hospital, and took swabs from the nose and throat respectively of each. Dr. Lewis examined the resulting cultures, and in all cases where he found bacilli showing polar staining with the Neisser stain and resembling the *Bacillus diphtheriæ* he isolated and investigated these bacilli. This work lasted from July 22 to July 26, 1912, and after the summer vacation from October 15 to December 19, 1912. On most of the weekdays during this time I swabbed a proportion of the cases who had been out of hospital ten days and who had not caused any return case. Altogether the series comprised 107 cases, but five of these subsequently caused return cases and were, of course, excluded. The cases were quite unselected, except that in the latter half of the series no cases were swabbed unless there was at least one child in the house aged under 15 who had not had scarlet fever. The ages of the 102 cases which comprised the series were as follows :—

0-1 year ...	...	... 0 case	8-9 years	...	... 7 cases
1-2 years ...	...	... 2 cases	9-10 ,,	...	... 4 ,,
2-3 ,,	...	.. 2 ,,	10-11 ,,	...	... 3 .,
3-4 ,, ...	...	... 8 .,	11-12 ,,	...	.. 9 ,,
4-5 ,, ...	.	... 13 ,,	12-13 ,,	...	.. 2 ,,
5-6 ,, ..	... 16 ,,	13-14 ,.	...	... 3 ,,
6-7 ,,	...	.. 12 ,,	14-15 ,,	...	... 5 ,.
7-8 ,, ...	...	... 8 ,,	over 15 ,,	...	... 8 ,,

In the 102 Dr. Lewis found twenty with Neisser-positive polar staining bacilli. He plated out all these and succeeded in isolating the

Neisser-positive bacillus in all except two cases.   In the eighteen cases in which isolation was successful the bacillus in seven instances proved to be the true *Bacillus diphtheriæ*, as determined by morphology and culture reactions (*see* above).   All seven proved virulent to unprotected guinea-pigs and produced fatal results, though in two cases death did not take place until the tenth and eleventh day respectively, with necrosis at the site of injection.   The bacilli were recovered in pure culture from the local lesions.   All the seven were harmless to guinea-pigs previously protected by the injection of diphtheria antitoxin.   The other eleven isolated bacilli did not correspond with Loeffler's bacillus in culture reactions, and some also in microscopical appearance.   Thus about 7 per cent. of the patients whose return from hospital gave rise to no return cases showed the true *Bacillus diphtheriæ*, contrasting with 25 per cent. of those who did show themselves in this way to be able to infect others with scarlet fever.   Even then it is possible that some of the seven were really infectious, but for various reasons, such as immunity to scarlet fever on the part of other members of their households, were unable to cause return cases.   Indeed, some of them had nasal conditions which one knows to be frequently associated with the production of return cases.

Section III.

When I was in possession of these facts as to the distribution of this germ in scarlet fever, it appeared desirable to compare them with the prevalence of the same germ in the normal population, especially amongst children, who, of course, furnish the bulk of our scarlet fever cases.

The most comprehensive piece of work on these lines appears to be that recorded in the " Report on Diphtheria Bacilli in Well Persons " (1902) [9] of a Committee of the Massachusetts Association of Boards of Health.   In this investigation over 4,000 persons were examined, and the results were divided into two groups.   In the case of 3,096 persons from communities practically free from diphtheria, 1·4 per cent. showed typical diphtheria bacilli, of which 0·9 per cent. had them in the nose, and 0·6 per cent. in the throat.   Fifty-five of these positive cultures were tested and five proved to be virulent.   In the case of 1,154 persons, almost entirely children, in institutions where diphtheria had existed from one to eighteen months previously, the figures were higher—viz., 2·9 per cent., of which 2·1 per cent. showed the bacilli in the nose, and 1·5 per cent. in the throat.   Thirty-one of these positive cultures were tested and six found to be virulent.   The difference between these two sets

of cases is attributed by the Committee to the difference in the prevalence of diphtheria in the communities under consideration. This conclusion is obviously of great importance when we are considering the distribution of this bacillus.

That diphtheria bacilli are frequently to be found in healthy persons who have been exposed to the infection of diphtheria is well known. Graham-Smith (1908) [5] points out that the frequency of this occurrence depends largely upon the intimacy of contact, a larger proportion of carriers, for instance, being found in the members of the families of diphtheria patients than in the scholars of diphtheria-infected schools. Seligmann (1911) [11] has noted that in diphtheria-infected institutions the departments with fewer cases tend to contain fewer "carriers" than the departments with greater numbers of cases (he dealt mainly with the throats only). Steenmeyer [12] failed to find diphtheria bacilli in the throats of forty-four children in a Dutch village which had been free from diphtheria for ten years, but in the throats of forty-one children of Utrecht, where diphtheria was endemic, he found diphtheria bacilli in several. Graham-Smith [6] concludes that virulent diphtheria bacilli are very rarely found in the throats and noses of healthy persons who have not been in immediate or remote contact with cases of diphtheria, but that in 2 to 3 per cent. of persons unexposed to infection bacilli are to be found differing from ordinary diphtheria bacilli only in their non-virulence to guinea-pigs.

The fact that the degree of prevalence of diphtheria in a community is reflected in the prevalence of the bacillus in healthy persons must therefore be held to explain the great disparity which appears amongst various published results [3].

For this reason I did not feel justified in making any assumption as to the prevalence of the *Bacillus diphtheriæ* in the Birmingham population. I therefore resolved to take swabs from a number of normal school children. For this purpose I selected two schools, and, beginning in January, 1913, took swabs from the nose and throat respectively from certain of the scholars (by kind permission of Dr. G. A. Auden, School Medical Officer, Birmingham). One school (D) had been entirely free from diphtheria for at least eighteen months, and during that time had produced only a few cases of scarlet fever. The other school (N) had produced only three cases of diphtheria during the past two years, but had been afflicted with a considerable outbreak of scarlet fever during the autumn and winter, cases continuing to occur in abundance during the time that I was taking swabs. I

selected only children who gave a history of never having had scarlet fever or diphtheria. In all, one hundred children were swabbed, fifty of each sex. Half were from school D and half from school N. The ages of the hundred were as follows:—

5-6 years	...	...	16 children	10-11 years	...	...	3 children
6-7 ,,	...	...	25 ,,	11-12 ,,	...	...	2 ,,
7-8 ,,	...	...	22 ,,	12-13 ,,	...	...	8 ,,
8-9 ,,	...	...	11 ,,	13-14 ,,	...	...	10 ,,
9-10 ,,	...	...	1 child	14-15 ,,	...	...	1 child

Amongst the cultures from the hundred children Dr. Lewis found "positive" bacilli appearing to warrant further investigation in eighteen; and all of these he isolated and tested. Seven of the germs proved to be Loeffler's bacillus, as judged from microscopical appearance, and culture and sugar reactions. Of these seven, one was fully virulent to the guinea-pig, but not to the antitoxin-protected animal, and the other six only produced slight local swellings at the site of injection. The other eleven positive bacilli proved not to be the *Bacillus diphtheriæ* by the above tests. Thus amongst these school children 7 per cent. gave true *Bacillus diphtheriæ* (of which only a minority were fully virulent). It will be noticed that the Loeffler bacilli from these school children were less virulent than those from the scarlet fever convalescents.

In the school D, comparatively free from scarlet fever, only two children (= 4 per cent.) showed the *Bacillus diphtheriæ;* whereas, in the school N, where scarlet fever was prevalent, five (= 10 per cent.) did so.

The fact that such a distribution of these germs occurs in schools which are almost free from diphtheria has an important bearing on the question of the administrative action to be taken in regard to such apparently harmless "carriers" when diphtheria cases do occur.

PREVALENCE OF CLINICAL DIPHTHERIA IN BIRMINGHAM.

A point of interest in connexion with these observations is the fact that neither the post-scarlatinal diphtheria rate in the Birmingham fever hospitals, nor the diphtheria rate for the city, is high, in face of the fact that there is such a wide distribution of the *Bacillus diphtheriæ* in the scarlet fever wards of the hospitals and a constant discharge of patients with this germ from the hospitals back into the general population.

In 1910 and 1911 together the post-scarlatinal diphtheria rate in Lodge Road Hospital was 0·7 per cent. reckoned on 545 admissions,

and in Little Bromwich Hospital 0·2 per cent. on 3,703 admissions. The returns for the two hospitals, however, give a higher rate for cases admitted with simultaneous scarlet fever and clinical diphtheria during those years—namely, 1·3 per cent. of scarlatinal admissions for 1910, and 3·4 per cent. for 1911. The above figures are from the Annual Reports of the Medical Superintendents [1].

The diphtheria death-rate for Birmingham (old city) for 1910, 1911, and 1912 was 0·11, 0·13, and 0·12 per 1,000 respectively, which was nearly the same as that for England and Wales generally, and less than that for many other large towns.

SECTION IV (CONCLUSIONS).

The fact that typical *Bacillus diphtheriæ* was isolated from the scarlatinally infectious "primary" cases in 25 per cent. of instances,[1] but only in 7 per cent. of those cases of scarlet fever whose return from hospital had not produced return cases, and in 7 per cent. also amongst normal school children, seems to show that the presence of this germ in the nose or throat of cases of scarlet fever is often associated with a prolongation of the period of scarlatinal infectiousness; and that the presence of the germ is indicative of an increased probability of such infectiousness. The question then arises how this is brought about.

It is well known that rhinitis (and sometimes otorrhœa) is common among the patients who produce return cases, and most observers hold the reasonable opinion that it is then the actual cause of the return case. We also know from such work as that of Todd [14] and of Williams [15] that the *Bacillus diphtheriæ* is very frequently present in such conditions. These two circumstances together may conceivably be the explanation of the association of scarlatinal infectiousness with the presence of the diphtheria bacillus.

At once we are faced with the question whether the bacillus is the cause of the rhinitis or only an association. Its invariable occurrence in the scarlatinal rhinitis investigated by Todd supports the idea that at any rate in such cases as those it is the actual cause. Cases of fibrinous rhinitis in scarlet fever are generally held to be due to the diphtheria bacillus. Graham-Smith [7] collected cases of "chronic membranous rhinitis" from various investigators, and states that all the (eighty-four) cases showed diphtheria bacilli, of which seventy-six were virulent. In

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[1] This is in terms of houses. The corresponding figure for total "primary cases" is 23 per cent.

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atrophic rhinitis also Symes [13] found that out of twenty-three cases (mostly adults) these bacilli were present in twenty, and that both of the two that he tested on guinea-pigs behaved like virulent Loeffler bacilli. On the whole it appears probable, though not certain, that the rhinitis is the result of infection with the bacillus.

In my former paper on this subject I mentioned that of ninety-eight primary cases no less than sixty-seven (i.e., 68 per cent.) had suffered from rhinitis since return from hospital, as shown by nasal discharge, or sore nostrils, or by a history of " cold in the head " since return; and of these sixty-seven persons, fifty (or 74 per cent.) gave positive swabs some time after the onset of their illness.

On the other hand, a number of return cases have followed upon the return from hospital of patients who have not had any signs of rhinitis, and who yet show bacilli morphologically, like Loeffler's bacilli (in some instances definitely proved to be *Bacillus diphtheriæ*).

If the action of the diphtheria bacilli is merely to keep alive a pathological condition (rhinitis) in which the hypothetical germs of scarlet fever can continue to remain virulent, presumably this is a property shared by other organisms which can cause rhinitis (I have seen many cases of rhinitis during and after scarlet fever in which negative swabs were repeatedly given). It may be, however, that this bacillus has a peculiar property itself of enabling the virus of scarlet fever to flourish (symbiosis) even without causing rhinitis.

Bearing upon the mode of action of the bacilli, I have collected cases of scarlet fever occurring during the period (two years) under review in which the scarlet fever (confirmed as to diagnosis after admission to hospital) occurred after the return to the same house of a patient from the fever hospital who was sent in for supposed scarlet fever, but in whom the diagnosis was revised to " not scarlet fever." None of these primary cases gave any evidence either in hospital or subsequently of having contracted scarlet fever during their stay in the institution. I have not counted cases in which the first patient had clinical diphtheria.

In this series I have fourteen cases, of which twelve were swabbed after the occurrence of the return case; and of these twelve, eight were positive and four negative. Two of the three positives which were isolated proved to contain typical *Bacillus diphtheriæ*. I think these cases are particularly significant as admitting of the explanation that in contracting these bacilli, which are so prevalent in the scarlet fever hospital, the patients thereby became able to spread scarlet fever, although they themselves had not shown any signs of this disease— as if the diphtheria germ brought with it the scarlatinal virus.

It may be here stated that the hospital results have not shown the return cases to give a much higher proportion of positive results at the time of admission to hospital than cases in general. During 1911, thirty-four out of ninety-six return cases thus examined on admission gave positive results—i.e., 35 per cent. compared with 30 per cent. (both hospitals) for all cases. It should be noted that this refers to total " positives " and not to definitely proved *Bacillus diphtheriæ*, the necessary isolation not having been carried out.

As bearing upon this connexion between the diphtheria bacillus and scarlatinal infectivity, it is interesting that there is some evidence of a certain degree of clinical and epidemiological interdependence between the two diseases. For instance, it is the experience of many fever hospital doctors that scarlet fever cases are more liable to contract diphtheria than are normal children : and the two diseases seem to be more frequently co-existent in one patient or one family than mere chance would explain. The distribution of diphtheria throughout the year in this country also corresponds with that of scarlet fever, both diseases increasing in prevalence during the latter half of the year. There is also a partial tendency for the cyclical variation in scarlet fever from year to year to be accompanied by corresponding variations in diphtheria—that is to say, scarlet fever " epidemics " are often simultaneous with similar increases in diphtheria. The Birmingham figures for the past twenty years show this latter correspondence to be only partial, and there are certain other respects, such as the epidemic wave-length of the two diseases in schools, in which they are quite at variance. However, I have noticed that in schools where outbreaks of scarlet fever are occurring there are not infrequently more cases of diphtheria than usual.

The natural corollary to concluding that the diphtheria bacillus in scarlet fever cases tends, either by causing rhinitis or in some other manner, to increase the proportion of return cases, is the consideration of how to keep hospital cases free from the germ. If the positive patients were to be isolated from the negative ones on admission, the " positive " wards would have to be almost as big as the " negative " wards, and the practical difficulty would arise of the impossibility of making an accurate diagnosis in some cases of the bacillus in question without isolating and testing it. A further difficulty would arise from the definite fact that a patient may have the germ about his nose or throat without it being revealed on one swabbing. Moreover, at any

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rate in wards where this rigid separation is not practised, cases of rhinitis with this bacillus frequently occur, and such cases can quickly infect others in the ward who were previously negative. The nurses in scarlet fever wards are sometimes found to be "positive," and this would probably be another difficulty. Attempts to avoid discharging patients with the *Bacillus diphtheriæ* would be met by the difficulty that the condition is often very intractable and may persist a long time. I have seen cases which remained positive for more than a hundred days after discharge from hospital. I understand that the injection of diphtheria antitoxin does not clear up the germs, and I have no knowledge or information as to the more hopeful method of injecting vaccines of the bacillus.

REFERENCES.

[1] Birmingham Health Reports, 1910 and 1911.
[2] ESCHERICH und SCHICK. "Scharlach," 1912, p. 164.
[3] EYRE and FLASHMAN. *Brit. Med. Journ.*, 1905, ii, p. 1104; GRAHAM-SMITH, "The Bacteriology of Diphtheria," 1908, p. 194; HEWLETT and MURRAY, *Brit. Med. Journ.*, 1901, i, p. 1474: LOUIS PARKES, *Public Health*, 1903, xv, p. 538.
[4] GARRATT and WASHBOURN. *Brit. Med. Journ.*, 1899, 1, p. 893.
[5] GRAHAM-SMITH. "The Bacteriology of Diphtheria," by Nuttall and Graham-Smith, 1908, p. 197.
[6] *Idem. Ibid.*, p. 194.
[7] *Idem. Ibid.*, p. 359.
[8] HIGGINS. *Public Health*, 1912, xxv, p. 259: Birmingham Health Report, 1911, p. 24.
[9] *Journ. of the Massachusetts Assoc. of Boards of Health*, July, 1912
[10] PUGH, W. T. G. *Journ. of Hyg.*, 1902, ii, p. 286.
[11] SELIGMANN. *Zeitschr. f. Hyg.*, 1911, lxx, p. 59.
[12] STEENMEYER. Quoted by Lewandowski, *Centralbl. f. Bakt.*, 1904, xxxvi, p. 347.
[13] SYMES. *Lancet*, 1903, i, p. 484.
[14] TODD. *Lancet*, 1898, i, p. 1458.
[15] WILLIAMS. *Brit. Med. Journ.*, 1901, ii, p. 1799.

DISCUSSION.

Dr. R. DUDFIELD wrote as follows : In 1895 I noted the frequent occurrence of nasal discharges in returned patients giving rise to "return cases," and drew the attention of Professor Simpson to the fact when he was making the first investigation for the Metropolitan Asylums Board. Professor Simpson recorded the above fact in his report to the Board. Incidentally, I may say that I am somewhat surprised that no reference is made by Dr. Higgins to the voluminous reports on the subject of "Return Cases," issued by that Board. I believe that a good deal of bacteriological research was carried out in connexion with the preparation of those reports, but I have not been able to verify that impression. Dr. Higgins records the presence of the *Bacillus diphtheriæ* in the throats and noses of primary patients, but he does not say whether any swabs were taken from the members of the families of such patients. In other words, he does not appear to have excluded the possibility

of infection with diphtheria bacilli after discharge from hospital. It would be interesting to know if the secondary cases due to primary sufferers in whom the diphtheria bacillus was demonstrated at home were found to have the bacillus after admission to hospital, and if so, whether such secondary cases presented any special clinical symptoms in hospital. As to the prevalence of carrier cases in schools, Dr. Higgins has omitted to give any indication of the different proportions of " carriers " to children swabbed in the two schools. He only states that " 15 per cent. gave positive swabs." It would be instructive to know whether the major portion of such positive swabs came from school D or school N, the former school having apparently the cleaner record *qua* diphtheria. I expect to publish very shortly some notes on" carriers " in schools.

The PRESIDENT (Dr. W. H. Hamer) wished to say a word with regard to Dr. Higgins's observations to the effect that there was " some evidence of a degree of clinical and epidemiological interdependence between scarlet fever and diphtheria." It was interesting to note how this conclusion came up again and again. Seven years ago Dr. Nash read a paper before the Epidemiological Society [1] on a somewhat similar subject and pointed out the same thing. He (Dr. Hamer) had the curiosity at that time to look through the *Transactions* of the Society, and it was remarkable how many papers had been read in which that interdependence had been alluded to. At the time of the great diphtheria prevalence (1858 and 1859) there were papers by Burdon-Sanderson, Ballard, and Bristowe, dealing with the subject, and a sub-committee of the Epidemiological Society was appointed with Mr. Netten Radcliffe as secretary; this sub-committee concluded that " there was considerable coincidence of time and place in the occurrence of these two diseases," and declared that this question was one well deserving further study. Dr. Ransome, too, read a paper in 1875 in which he dealt with the same topic. He, however, pointed out two difficulties; he said scarlet fever was milk-borne but diphtheria was not; that difficulty had been removed since the date of that paper; again, Dr. Ransome said that diphtheria was transmitted by sewer air, while scarlet fever was not; that difficulty also was one to which epidemiologists would not attach very much importance at the present time. There was, further, in 1883, an important paper by Dr. Franklin Parsons dealing with the same question. He (the President) considered that Dr. Higgins's paper just read afforded another proof, if proof were needed, that well-authenticated epidemiological results occasionally emerged to view even when inquirers started by assuming the specificity of particular " causal bacilli."

Dr. E. W. GOODALL said he thought the Section could congratulate Dr. Higgins on having brought before it new facts in respect of, at any rate, the prevalence of the diphtheria bacillus. The relationship between that disease and scarlet fever was very well known. Some observers of admitted knowledge had gone even further than those mentioned by the President ; for instance, the late Dr. Bond, of Gloucester, had believed scarlet fever and diphtheria to

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[1] " Evolution in Relation to Disease," *Trans. Epid. Soc. Lond.*, 1905-6, n.s. xxv, pp. 204-44.

be manifestations of the same disease. He (the speaker) did not take that view, and he mentioned it only to show how close the connexion had appeared to be to some observers. Dr. Higgins had proved, in reference to Birmingham at any rate, the somewhat extensive prevalence of the diphtheria bacillus, though not of the disease diphtheria. There did not seem to be in other places the same prevalence of that organism. No particular work in this connexion had been done in the hospital with which he was connected in recent years. But from work done some years ago he would have said that the proportion of diphtheria carriers in scarlet fever wards was not high; and that not many cases in which rhinitis arose after leaving the hospital showed the diphtheria bacillus. For many years past he had requested his assistant medical officers to make cultivations from the nose in chronic cases of rhinorrhœa, because in some diphtheria bacilli would be recovered. In those cases the organism was probably the cause of the chronic inflammation, and the rhinitis would often clear up after a dose or two of antitoxin. From what Dr. Higgins had said it would seem worth while to go into the subject of the prevalence of the diphtheria bacillus in some of the large London hospitals again, to see if there had been any alteration of the incidence. With regard to clinical diphtheria, he had studied the question on more than one occasion, and had read a paper before the Epidemiological Society on the subject, pointing out that if in a particular town scarlet fever and diphtheria were prevalent, cases of post-scarlatinal diphtheria would be found among the scarlet fever patients, and of post-diphtherial scarlet fever among the diphtheria patients. Post-scarlatinal diphtheria began to make its appearance in the hospitals of the Metropolitan Asylums Board in 1886 to 1888, when the disease began to be prevalent in London and just before it was admitted to the hospitals of the Board. Some years ago Dr. Meredith Richards had pointed out that they were not troubled with post-scarlatinal diphtheria in the Birmingham Fever Hospital until diphtheria began to be prevalent in Birmingham. Towards the end of his paper Dr. Higgins had said that it was the experience of many fever hospital doctors that scarlet fever cases were more liable to contract diphtheria than were normal children. But he (Dr. Goodall) was inclined to doubt that. From a twenty-one years' experience he could say that post-scarlatinal diphtheria was not so common in the wards of his hospital at the present time as it used to be, and he believed that the lessened prevalence of diphtheria in scarlet fever convalescents in hospital went with its decreased frequency in London generally. He had pointed out in his paper before the Epidemiological Society that a comparison of the age-incidence of post-scarlatinal diphtheria among the children in the hospital with the incidence among children in London generally showed that it was very little higher among the former than among the latter. He wished to ask a question concerning those patients referred to by Dr. Higgins who were found on admission to hospital not to have scarlet fever and yet contracted diphtheria bacilli in the hospital. He asked whether those cases had been treated in isolation wards or among the other scarlet fever patients? At Homerton a very careful clinical examination was made on admission, and where there was any doubt the patient was placed in an isolation ward and

kept there for three or four weeks before being sent home again. It would be a curious fact if the patients in the Birmingham Fever Hospital were found to have acquired diphtheria bacilli even though they had been treated in isolation wards.

With regard to the treatment of these cases, the diphtheria bacillus was fairly frequent in Birmingham; it was one of the common flora of the nose, especially of scarlet fever patients in the Birmingham fever hospitals. Whether that was so now in London he could not say, as he did not know of recent work on the subject. But what treatment should be carried out? If one had an enthusiastic assistant medical officer who swabbed every throat and nose and wished to isolate every case in which the bacillus was found, the isolation accommodation would soon have to be doubled. He had long given up isolating bacteriological cases in separate wards. In such cases he carried out what was termed the "barrier" treatment—i.e., he kept the patient in the general ward, but adopted measures to keep everything for his separate use. Under those circumstances the disease did not spread. In the absence of any marked increase in the "return case" rate of scarlet fever he doubted whether the diphtheria bacillus had much to do with "return cases" of scarlet fever, and therefore he did not think that measures directed to the elimination of diphtheria bacilli from scarlet fever convalescents were necessary. As a matter of fact, all such measures as had hitherto been tried were quite unavailing. While he believed that the diphtheria bacillus was the cause of diphtheria, facts such as these brought forward by Dr. Higgins only went to show how little we really knew at present of the conditions that favoured the pathogenicity of that organism.

Dr. F. THOMSON said his views largely coincided with those expressed by Dr. Goodall, and there were very small differences in the ways their respective hospitals were conducted. Perhaps he (the speaker) isolated more cases in which the bacilli were found in the throat, and, on the whole, he did more cultivations, including all cases of rhinitis in scarlet fever. He did not now find the organism in a high proportion of cases; the percentage used to be higher. About eight years ago post-scarlatinal diphtheria became rather suddenly less frequent in the wards of the fever hospitals. In his establishment they started making cultures from the throat and nose of every patient admitted, three or four for each patient, and every case in which the diphtheria bacillus was found was put into a separate ward. Then there was found to be but little post-scarlatinal diphtheria in the wards, and they were congratulating themselves on their improved statistics, when it was found that the result was practically the same at other hospitals where this had not not been done. He asked Dr. Higgins whether the cases given as negative had more than one swab examined. Unless that were so he did not see much value in the negative figures. He did not regard post-scarlatinal diphtheria as so very prevalent after all, certainly not so prevalent as it was some years back. His experience was that diphtheria was more common in association with measles than with scarlet fever. In the way of treatment he had tried all sorts of things, especially for the chronic "carriers," but failed. He had also tried various

vaccines, with the same absence of result. Latterly he had been trying *Staphylococcus aureus* broth culture; but five weeks' treatment of a noted London carrier had had no result.

Dr. T. G. MACAULAY HINE: In the first place I do not like the term " positive " being used in regard to cultures merely showing Neisser-staining bacilli, some of which latter proved not to be the diphtheria bacillus. Also it is not very uncommon to find bacilli showing metachromatic granules which are non-Gram staining, but no mention of this stain is made, but only of carbol thionin as a simple stain.

I wish now to examine some of Dr. Higgins's figures. He says he has examined about 380 cases by swabs from his "primary" cases, and out of these he had secured 145 "positive" reports of the presence of *Bacillus diphtheriæ*, or 38 per cent. He then remarks that some doubt having been cast on the identity of the organism seen, a series of thirty "positive" cases was properly investigated and thirteen of these proved to contain the Klebs-Loeffler bacillus. Of these thirty cases the organism could only be isolated in twenty-two, and the percentage of the true bacillus was therefore 60. Now he uses this figure later on in connexion with his total cases, and there-fore, supposing he is right in doing this, I consider he should have called it thirteen in thirty positive swabs and not thirteen in twenty-two—i.e., the percentage should be 43'3. Applying this figure, the best percentage he can claim is 16'6 of *Bacillus diphtheriæ* of the total cases examined, and this for another reason, I consider, is still too high. The other reason is that there seems to me to be a possible, and even probable, source of error in that we all know that by far the most common location of the true bacillus is in the throat, and that the chief habitats of the diphtheria-like bacilli which are more frequently mistaken morphologically for the Klebs-Loeffler bacillus, are the nose and ear. Now Dr. Higgins gives the source of the bacilli found, both in his total cases and in the cases accurately examined in which the *Bacillus diphtheriæ* was identified, and I here place these two series side by side. (I have, of course, subtracted his proved cases from the totals.)

Source	Identified				Unidentified
Nose	6	...	...	...	106
Ear	—	...	...	...	5
Nose and ear	1	...	...		3
Throat	1	..	...	...	3
Nose and throat	4	...	...	...	15
Nose, throat, and ear	1	...	...	...	—

The above table shows that these series are very disproportionate, and as he claims to apply his figures of his identified ones to the unidentified ones, I consider that they should show more correspondence in their sources—e.g., the figure for the " nose alone " should be nearer eighteen than 106 if they are to be considered comparable.

My reasons, I repeat, for making this point are that, firstly, we know that the bacilli from this region, the nose, are the most fruitful in causing error, that the organisms properly investigated differ so materially from those in

the total figures as regards their source, and that 106 out of 112 were only diagnosed from their morphological resemblance to the Klebs-Loeffler. This seems to open too wide a field for error, and I therefore do not consider Dr. Higgins is justified in applying the figure of the small series to the total numbers. I feel that if all the organisms had been properly investigated, he would not have more than 10 per cent. instead of his 25 per cent. The experience of other observers, which he quotes himself, seems to bear this out.

The whole position seems to be dominated by the bacteriological diagnosis of the *Bacillus diphtheriæ*. If, either for reasons of time or expense, the bacteriologist be asked to make a diagnosis on the examination of swabs combined with a single culture alone, there is bound to be a certain number of mistakes, even by experienced observers; these mistakes are generally in the right direction, for the true bacillus is rarely overlooked and the error is nearly always in giving a positive report, when a more prolonged and expensive investigation would justify a negative one.

The identification of the *Bacillus diphtheriæ* by the whole of its characters when completely investigated is admittedly quite reliable, but from practical consideration it is impossible to adopt this as a routine method. The preliminary identification of the bacillus by a small portion only of its characters is known to be open to error, especially in the case of cultures not from the throat, and when the examination is confined to the microscopic appearance of a film from a swab alone the report is practically valueless.

I have spent considerable time during the last six years in investigating this question of the identification of the Klebs-Loeffler bacillus, and, as the result, I have been engaged latterly in attempting to devise a special medium by which the bacillus may be recognized more quickly and surely than it is at present on the usual Loeffler's serum, and with some promise of success. Earlier in this year I communicated to the Pathological Society the results of some of my investigations into the biochemical reactions of the *Bacillus diphtheriæ* and five or six other members of this group. I feel sure that much might be accomplished by a well organized research on these or similar lines, and any method which would make these examinations less expensive, and at the same time as reliable and more expeditious, would be generally welcomed.

In criticizing Dr. Higgins's paper as to the existence of the *Bacillus diphtheriæ* in the proportions suggested, I do not want it to be thought that I wish to disagree with his conclusions altogether. The frequency with which the members of the diphtheria-like group are associated with chronic irritations, as in nasal sinusitis, in combination with the gonococcus in old urethritis, and in sinuses arising from old abscesses, seems to indicate that these organisms may have more than a purely passive rôle, and it may well be that their occurrence after scarlet fever in the discharges from the nose and elsewhere has some connexion with the continued capacity of these cases to infect others, as Dr. Higgins suggests. The position I feel inclined to assume is that I look upon the whole group with suspicion; other members have already been proved to have a pathological action, notably the *Bacillus coryzæ segmentosus* in a certain type of " colds," and the *Bacillus paralyticus* of Ford Robertson is at least

pathogenic to rats. I therefore see no reason why other allied organisms should not eventually be convicted of causing disease.

Dr. S. MONCKTON COPEMAN said he had been struck by the fact that although there was this enormous proportion of cases carrying diphtheria bacilli, yet none of the return cases had diphtheria clinically. That seemed to show that we were yet far from knowing everything with regard to the ætiology of either diphtheria or scarlet fever. Many of the cultures, although said to be positive, did not respond to the special tests for the diphtheria bacillus on culture; and he felt inclined to agree with the President's scepticism as to the importance of the demonstration, in the throat or nose, of such bacilli, certainly in those cases from whom swabs did not give a positive reaction in test cultures and in many of those which did. He agreed with Dr. Hine in not regarding as worthy of note any organism which did not give a positive result when inoculated into the guinea-pig. They might have been derived by inheritance from virulent bacilli; but it was now recognized that although it was comparatively easy by the use of selective culture media to reduce the virulence of a micro-organism, it was not by any means as easy to increase it. If the tests detailed were to be carried out in every instance it seemed that a tremendous amount of time and labour would be entailed, and it was fitting to ask whether it was worth while. Much was said about positive diagnoses being given in diphtheria, but probably not one in a thousand dealt with the full tests such as had been described. With regard to getting rid .of the organism, it was known that antitoxin had no effect on the organism itself, except indirectly by neutralizing the toxin secreted, and therefore one could not expect to clear out these organisms from the throat merely by the administration of antitoxin. With regard to vaccines, he would refer to the results of experiments conducted at the instance of the Local Government Board in regard to skin organisms, which were probably in an analogous position, because diphtheria organisms in like manner were only found on the surface of tissues. On his initiative Colonel Sir Wm. Leishmann and Major Cummins carried out an enormous amount of work in connexion with the Government Vaccine Establishment, to see if it was possible, prior to the collection of lymph, to purify it from extraneous micro-organisms by the use of autogenetic vaccines, prepared from the cocci normally found in the lymph, prior to glycerination. Somewhat unexpectedly, however, no result was obtained as regards diminution of the bacterial flora, although it was a laborious and detailed investigation, such as had not, he thought, been undertaken before. Therefore he did not think vaccine or staphylococcic preparations were likely to be of any service in the destruction of the diphtheria organism. Until more was known about the micro-organism of scarlet fever—on which much work was being done at the present time—he did not think it was possible to draw a definite conclusion as to the precise inter-relationships of this disease with diphtheria.

Dr. F. G. CROOKSHANK said although in 25 per cent. of the author's cases the Klebs-Loeffler bacillus had been found, what was found in the other 75 per cent. ? Because if in any considerable number some common organism such as a

staphylococcus was present, the conclusions which had been expressed in respect of the Klebs-Loeffler bacillus might with equal force have been applied to that other organism. He, however, regarded Dr. Higgins's work as very important, so far as it went. He feared that professed bacteriologists had fallen into a habit of investigating flora of the throat from the point of view of the presence or absence of one special bacillus. What was really needed was complete knowledge of flora of the throat in any particular case. It had been shown that one did not often find staphylococcus infection associated with diphtheria; yet it was very common to have staphylococcus infection associated with scarlet fever. In view of the restraining power of the staphylococcus over the diphtheria bacillus, he thought that point should be followed up. One explanation seemed to have been omitted from the paper—namely, that the diphtheria bacillus persisted in some of the scarlet fever cases, for the simple reason that scarlatinal rhinitis afforded a favourable medium in which diphtheria bacilli could grow, perhaps in a quiet and unobtrusive way. The association between scarlet fever and diphtheria was perhaps not a necessary one, though not the result of pure coincidences. He suggested there was perhaps lurking in the background some other factor. He felt in general agreement with Dr. Goodall's remarks. When he (Dr. Crookshank) had charge of an Isolation Hospital, he used at first to swab every diphtheria case two or three times before sending it out; and he felt that in doing this he was acting very conscientiously. But afterwards he felt convinced that this work was quite supererogatory, and he did not remember having seen a return case of diphtheria either if the throat had been swabbed or if it had not. In many of the cases of scarlet fever in which the diphtheria bacillus was found in the throat, there was doubtless a " tolerance " of the latter organism, and the patient was even less likely to contract the disease than anyone who at the moment had not got the organism. Although, however, one might disagree with some of the conclusions that Dr. Higgins had submitted, or feel that the information he had given was not quite complete enough to justify definite conclusions being drawn, he would deprecate the suggestion of Dr. Copeman that such collections of facts involved a large amount of useless labour. From the point of view of immediate clinical result it might seem so, but from the standpoint of the scientific investigator work of this kind should not only be repeated, but multiplied many times.

Dr. HIGGINS, in reply, said that the completed results of the swabbing of school children, which were not included in the uncorrected proof that Dr. Dudfield saw, showed that the school (N) where scarlet fever was epidemic did furnish a larger proportion of children with diphtheria bacilli (10 per cent.), than the school (D) where scarlet fever was not epidemic (4 per cent). In regard to Dr. Dudfield's other question, it was not found that the corresponding primary and return cases always agreed as to the presence or absence of the diphtheria bacillus.

In reply to Dr. Goodall he said that the non-scarlets who caused return

cases had been kept in isolation wards, but in most cases had been exposed to scarlatinal infection.

In answer to Dr. Hine he said that in the majority of cases no further swabs were taken after a negative result was obtained, and agreed that a single negative result had not the value of a positive result. With regard to the criticism of the way in which he arrived at the figure 25 per cent., he contended that the method he pursued was a legitimate one—namely, to isolate all of a consecutive series of positive results and apply the percentage of true *Bacillus diphtheriæ* thus found to the total positives for the two years during which the inquiry lasted. Of course the result was an approximate estimate, but, as mentioned in the paper, it was supported by the fact that the same proportion of true diphtheria bacilli was actually isolated by Dr. Lewis from the primary cases from the northern half of the city during the time that the consecutive series lasted. If in thirty positive swabs the Neisser-positive bacillus was successfully isolated in twenty-two cases only, the percentage of true *Bacillus diphtheriæ* found should be reckoned on the twenty-two and not on the thirty, as he knew of no reason for supposing the diphtheroid bacilli to be more difficult to isolate than the true Loeffler bacilli.

In answer to Dr. Copeman and Dr. Dudfield he stated that there was a certain number of cases of clinical diphtheria associated with the return cases of scarlet fever. From December 19, 1910, to November 8, 1911, in which time 151 return cases occurred (in eighty-nine homes), in four instances the return case was admitted to hospital with clinical diphtheria as well as scarlet fever, and in one other instance two return cases of pure scarlet fever in one family were associated with a case of diphtheria occurring in the house at the same time. In addition three cases of pure diphtheria followed as return cases upon the return from hospital of cases of scarlet fever. None of the primary cases of scarlet fever whose return was followed by the eight cases of diphtheria above mentioned had clinical diphtheria, but six of these gave positive swabs.

In acknowledging his indebtedness to Dr. Lewis for the bacteriological work reported in the paper, Dr. Higgins mentioned that be believed Dr. Lewis was attempting to classify the various strains of Loeffler bacilli that he had obtained.

[*Note by Dr. Higgins.*—The figures which Dr. Hine worked out with regard to the site (nose or throat) from which the germs were obtained are very interesting, but his use of them to show that the proportion of true Loeffler amongst the consecutive series of thirty "positives" ought not to be applied to the total "positives" is not justified. The comparison in this respect ought to be between the series of thirty and the total "positives" and not between the eleven cases with proved *Bacillus diphtheriæ* and the total positives. As a matter of fact, amongst the thirty "positives," twenty-nine showed the germ in the nose or ear and five in the throat. This proportion of 29 : 5 is almost precisely the same as 141 : 24, which obtained amongst the total "positives." I therefore regard Dr. Hine's interesting method of analysing the figures as lending support to my thesis rather than the reverse.]

Section of Epidemiology and State Medicine.

May 23, 1913.

Dr. W. H. HAMER, President of the Section, in the Chair.

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Anthrax in the Woollen Industry, with Special Reference to Bradford.

By F. W. EURICH, M.D.

WHILE fully recognizing the honour you have done me in asking me to read a paper on "Anthrax" before your Section, I hesitated to accept the invitation, as my own interest in the anthrax problem has been confined to certain local issues, and because the whole problem has been so exhaustively dealt with by Dr. Legge not so very many years ago. The investigations, moreover, which are being carried on in Bradford are not yet completed. However, as your Secretaries agreed to accept the risk, it would have seemed uncivil to decline.

New industries, it is well known, often introduce new diseases. With the introduction of alpaca, mohair and the various Eastern wools into the factories of the Bradford district in the first half of the last century there appeared among the operatives forms of bronchitis, pneumonia, and so-called blood-poisoning of a peculiar deadly nature. The workpeople were quick to associate these outbreaks with the manipulation of this foreign material, but the medical profession was, as a body, slow to recognize in them specific features. A notable exception was Dr. J. H. Bell. Long before bacteriological investigations proved the specific nature of these cases he resolutely defended this view. On one occasion he even risked legal proceedings by inserting in a death certificate that the disease had been contracted owing to the employers' neglect in taking adequate precautions. He was, however, by no means clear what these adequate precautions

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were. His discovery in 1879 that wool-sorter's disease is a form of anthrax was the outcome of a suggestion thrown out by his friend Dr. Eddison, of Leeds, then fresh from the bacteriological laboratories of the Continent. Some years later a conference of representatives of employers, workpeople, health committee, and the medical profession took place, and certain regulations, known as the Bradford Rules, were drawn up. These earlier regulations were carried into effect voluntarily, and formed the basis for subsequent regulations made, and at various times amended, by the Home Office. These precautionary measures—the general tenor of them will be considered later—had a

Fig. 1.

Breaking the iron hoops that bind many bales. In the background are two men busy opening fleeces; the funnel-shaped receptacle under the table, for the dust, is connected with an extracting fan.

prompt and beneficial effect. The number of cases, especially those of the pulmonary variety, has been greatly reduced; but this reduction has occurred almost solely among those workpeople whose duty it is to handle the raw material before it has been washed. Even among this class of operatives cases still occur, and no subsequent amplification of the original rules appears to have had any pronounced effect upon the rate of incidence or upon the mortality from this disease.

It was evident that some important factor in the production of anthrax had not received due attention. What this element in the

FIG. 2.

Opening the fleeces upon an "opening board"—i.e., upon a wire grid through which the dust is drawn by means of a fan.

FIG. 3.

Sorted wool being placed upon a lattice and pushed along it into a willey machine. Note the intimate (and unnecessary) contact of the man with the material, as is also the case in the next figure.

JU—5a

causation of anthrax might be, and what further means of prevention could be adopted, were the main problems. To solve these, the Anthrax Investigation Board was formed.

Before giving you some of the results of these investigations, let me sketch, very briefly, the various processes through which alpaca, mohair—i.e., the hair of the angora-goat—and wool generally pass prior to being spun. The raw material arrives in bales, often, though not invariably, press-packed and bound with hoops of iron. When the bale has been opened the fleeces, which are rolled up and often
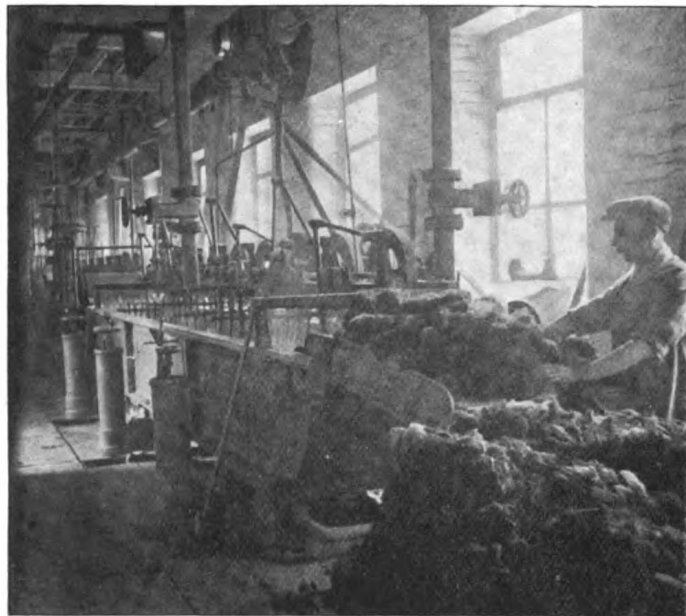
Fɪɢ. 4.

A workman is shown with a pile of wool at his feet, from which he is feeding a
washbowl, spreading the material upon the feeding lattice.

tied with knots, are taken out singly, opened out, thrown into large baskets, and passed on to the sorter. It is the sorter's duty to separate the various qualities of wool of which a fleece is composed, and to pick out foreign substances, such as locks, bits of rag and string, so often found within a fleece. The wool may then be taken direct to the wash-bowl, or it may first be passed through a " willey "—a machine in which the material is roughly torn and shaken out, in order to extract the coarser kinds of sand and dirt. The extent to which wool

may be washed will depend upon the use that is to be made of it. According to this, and also according to the nature of the material, the temperature of the water and the quantity of the alkali mixed with it will vary. In most cases the temperature of the bath is about 130° F. The wool remains in the wash-bowls about ten to twenty minutes, is passed into a drying machine, is often willeyed a second time, and in a more searching manner, and then passes to the carding engines. These machines consist of a series of rollers, set with teeth and arranged in such a way that the wool as it passes between each set of rollers has
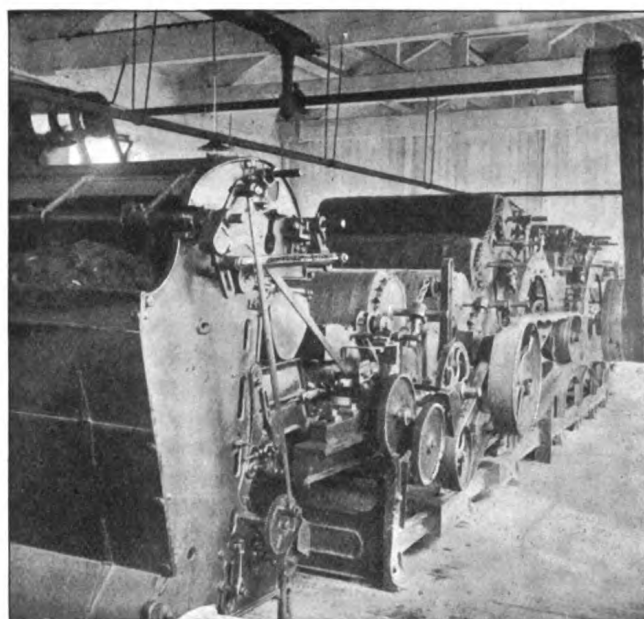
FIG. 5.

A carding engine. The wool is seen in the feeding receptacle on the left (filled by hand), and can be traced upon the rollers farther on as it passes between them. The rollers revolve at various speeds. Note the absence of any cover and of any extracting fan.

its fibres opened out and arranged in parallel bundles, with the result that it issues from the machine in the form of a loose rope called a "sliver." As a good deal of the natural fat of the wool is removed in the process of washing, a little oil is added to the wool as it passes through the carding-engine. A similar effect to that obtained by means of carding is got by passing the wool through what is called a preparing box; in this, too, the wool passes between rollers, and is

teased by sharpened points, but with this difference, that these points are not upon the rollers but travel quietly in the horizontal plane. It follows that this process of "preparing" is less violent than that of carding, and that almost no dust is thrown up into the air. The wool may then be combed in various ways. By it the wool fibres are straightened out, and the shorter fibres are separated from the long. The combed product is called the "top." Such fibres as are altogether too short to be combed are separated out by the machine, and constitute

Fig. 6.

Showing the opposite end of the same carding engine, the wool issuing in the form of a loose rope or "sliver," and being wound up into a ball.

what is called the "noil." In all these processes, the washing alone excepted, a certain amount of dust is given off. The regulations provide that during the processes of opening and sorting the dust shall be drawn away from the workers by means of down-draughts created by extracting fans beneath the opening screens and the sorting boards; but there are no regulations for enforcing similar precautions in stages following upon the washing.

Let us now turn to the cases. I have full records of 110; of

these nineteen belonged to the internal variety; they all died. Ninety-one were of the external type; of these thirteen ended fatally. The sites of the pustules are indicated in the following table :—

TABLE I.—SITES OF PUSTULES.

The figures in parentheses give the number of fatal cases.

Crown of head	1	
Forehead	9	
Temple	2	
Nose	1	
Cheek	13	(1)
Ear	2	
Inside nostril	1	
Behind ear	2	
Corner of mouth	2	
Eyelid	1	
Chin	2	
Lip	1	
Neck	28	(7)
Upper arm	1	(1)
Elbow	1	
Forearm	10	
Wrist	7	(3)
Back of hand	2	
Finger	2	
Knee	1	
Buttock	1	
Ankle	1	(1)
	91	(13)

The frequency with which the pustule occurs on the face, neck, and upper limbs is again brought out by this table. The relation of the severity of the case to the site of the pustule (the fatal cases alone are specially noted in the table) is interesting. Some of the figures are, of course, too small to be of much value, but it is worthy of note that the severest cases occur not only where there is a greater looseness of the cellular tissues, but in parts which admit of the freest movement. Compare, for instance, the relatively high mortality accompanying pustules on the wrist and the mild course generally run when the forearm is the seat of the mischief. The only case of malignant pustule on the ankle which I have seen ended fatally. I am convinced that to insure absolute rest to the part affected is an indispensable part of the treatment.

In the first three years the opsonic index was estimated in almost every case of malignant pustule—generally every day till the patient either died or was out of danger. The index is low during the active stages of the disease, and rises to normal or above normal after the pustule has been excised, or when spontaneous recovery takes place.

In one case the opsonic index rose after excision of the pustule, but quickly fell again, although the patient made no complaint; the dressings were removed, and it was found that a second infection had taken place at the site of operation; this, too, was excised, and the patient made an uneventful recovery. I have had no opportunity of testing the diagnostic value of the opsonic index in cases of internal anthrax, as I have never been called to see one before the infection had become generalized. It should be a useful aid to diagnosis in early cases, for I have several times been able to see the primary focus in a bronchus, twice in the tissues between the root of the tongue and a tonsil, and once in the stomach. Merely a microscopical examination of the serum or of the blood is, of course, insufficient for diagnosis; cultural methods should be employed in all cases. But failure to cultivate the bacillus does not preclude the possibility that the case is one of anthrax. Decomposition of the material, or the bactericidal property of the serum, may explain the failure. To reduce these fallacies to a minimum it is advisable, when such material has to be sent any distance, that some of it should be dried on to sterilized silk threads, or on to glass rods, and packed into test-tubes containing a few grains of chloride of calcium.

As to the treatment I need say little. Our surgeons practise excision of the pustule whenever that is possible, and this is almost invariably combined with the injection of Sclavo's serum. During the last three years, following Professor Sclavo's advice, I have advocated its use in doses of 80 c.c. given intravenously, followed in twenty-four hours by a dose of 60 c.c. if the case be a severe one. Should this treatment be refused by any patient—but I know of no case in which this has happened—I would recommend the trial of a vaccine. It is difficult to estimate the efficacy of any line of treatment, or to say how far it was affected by delay on the part of the patient in seeking medical advice, or by failure on the part of the doctor to recognize the nature of the disease. In this respect the fatal cases are very interesting. Of the nineteen cases of internal anthrax four had had no medical attention whatever, and eight were already moribund when skilled advice was sought. In not one of the remaining seven cases was the true nature of the illness suspected until the patient had passed into the state of collapse; indeed, in two instances it was the unexpected sudden death of the patient which first roused suspicion. Turning to the thirteen fatal cases of malignant pustule, I find that one patient had not sought skilled advice; in one case anthrax was not diagnosed till the

eighth day of the disease; in three instances advice was not sought till the fourth day, and in five not till the third. In only three cases was it sought within the first twenty-four or thirty-six hours, and of these, two were cases of erysipelatous anthrax, while in the third case death was probably accelerated by cirrhosis of the liver. A comparison of these with the cases that ended in recovery is very instructive. I have notes as to the dates of the first medical attendance and correct diagnoses in seventy cases. The accompanying table (*see* Table II) shows how with

TABLE II.—SHOWING RELATION OF SEVERITY OF CASE TO DATE OF FIRST MEDICAL ATTENDANCE. ONLY CASES THAT RECOVERED ARE CONSIDERED.

Day of disease	Spontaneous cure	Mild	Moderate	Severe
First	— —	—	6	—
Second	—	3	8	5
Third	1	7	15	3
Fourth	2	9	3	—
Fifth	—	—	2	—
Sixth	2	1	—	—
Seventh	1	—	—	—
Thirteenth	2	—	—	—

the lengthening interval between the first appearance of symptoms and the date of medical attendance the number of the moderately severe and of the severe cases increases. After the third day, however, the mild cases, and those which were undergoing spontaneous cure, gain the upper hand, while severe cases cease to occur; finally only cases undergoing spontaneous cure come under observation.

The total number of cases of anthrax, the outcome of contact with wool and hair in the Bradford district during the last ten years, has been 133. Some years ago Dr. Legge calculated that on the number of workpeople exposed to risk the comparative figure of attack was 1·3 per cent. This calculation was based upon the total number of people engaged in the sorting and combing of scheduled—i.e., of black-listed—wools, but did not take into account that the number of hands engaged in the various processes, respectively, to which the raw material is subjected up to and including the combing, is not the same. Nor can the risk of infection attaching to the various occupations be the same. It may be a coincidence, for the figures are small, but out of four card-grinders employed by a certain firm two contracted anthrax in the course of eighteen months. It is also interesting to note in this respect that out of a total of 106 patients, whose length of employment was determined, forty-nine had been exposed to risk for only twelve

months or less.   Workers of low-class wools are naturally, perhaps,
a somewhat shifting population; they pick up such work as offers and
readily abandon it again.   But so far as my inquiries have gone, the
average length of employment in the different departments will not
explain these figures.   They *may* be accounted for on the supposition
that a certain degree of immunity is in time acquired.   I have noted,
for instance, several cases who left their employment after a few years'
service, but, returning after an interval of some months, contracted
the disease.   Such relative immunity might be conferred by the
introduction of germs of low virulence, such as may undoubtedly be
found in wool.   I have examined the blood of a number of long-service
hands, but failed to discover any difference either in the opsonizing
power or in the bactericidal property of the sera.   The occupation of
the 110 patients is given in the following table :—

TABLE III.—SHOWING OCCUPATION OF CASES OF ANTHRAX.

The figures in parentheses give the number of fatal cases.

Warehousemen	4	(1)
Wool-sorters ...	22	(5)
Wool-pullers ...	2	(2)
Wool-runners...	3	(1)
Washbowl-feeders and wool-washers	13	(5)
Wool-dryer ...	1	(1)
Willeyers	11	(2)
Carders	20	(5)
Card-grinder ...	6	(2)
Box-minders ...	3	(2)
Finishers	2	
Combers	10	(3)
Picker-up	1	
Packer of tops	4	(2)
Shoddy willeyer	2	
Spinners	4	(1)
Mechanics	2	

from which it will be seen that sixty-six cases occurred among work-
people who would come in contact with the wool or hair after it had
been washed.   Now the dust which can be shaken from wool before it is
washed consists to a large extent of soil mixed with a little fluff; but
in the later processes a fine dust of broken fibres predominates.   If we
are to associate the anthrax spores in wool with the presence of dust
from the soil, then it is difficult to understand the frequency with which
anthrax is contracted in the later stages of the combing process; it
would be difficult to understand why, e.g., this sample of white, East

Indian wool, washed so beautifully clean, should still be full of the spores of anthrax, as it is. Nor does washing, though it necessarily removes many of the spores of anthrax, remove so many of them, relatively, as it does of other dust organisms. The obvious explanation of this is to be found in the adhesive property of blood. If blood-stains upon wool or hair are not too old, then the hæmoglobin is readily extracted by the alkali in the washbowl, but albuminous constituents may remain, and will glue the spores to the wool-fibres. When the blood-stains are old, then even thorough scouring will not delete them ; hence even the best washed materials may retain, in part at least, their power to infect. Practically all the difficulties of the anthrax problem centre around this matter of the contamination of wool and hair with infected blood. The wool-combing regulations, as in force to-day, aim (1) at the exclusion from manipulation of obviously dangerous fleeces, and (2) at protecting the worker from the dust during the opening of bales, and during sorting and willowing. They apply to certain black-listed materials only—to raw material grown in countries in which anthrax is known or suspected to be rife, and in which, for one reason and another—such as administrative incapacity, carelessness, &c.—no adequate precautions are being taken to prevent the inclusion of tainted fleeces. Hand in hand with such lack of precautionary methods and of supervision will go the perpetration of "false packing" —i.e., of the inclusion within a fleece of so-called "locks" and "pieces," by which are meant short strands of wool of inferior quality, not infrequently the sweepings of the knacker's yard, mixed, may be, with rags and bits of string. The extent to which false packing occurs can be seen from the following figures : 961,116 lb. of Baghdad fleece wools yielded 747 lb. of blood-stained "locks," $380\frac{1}{3}$ lb. of blood-stained "pieces," and only $18\frac{1}{5}$ lb. of blood-stained fleece; 260,843 lb. of Bussorah fleece wools yielded $26\frac{3}{4}$ lb. of blood-stained "locks," 424 lb. of blood-stained "pieces," and only $6\frac{1}{2}$ lb. of blood-stained fleece. Of course, not all these samples have been tested for anthrax, but the percentage of positive results is considerably higher in locks and pieces. As many of the samples tested had been for various reasons specially selected, a comparison of the percentages might not be altogether a fair one. The importance of the rôle played by locks and pieces may be made clear by means of the following calculation ; the average frequency with which anthrax spores have been detected in blood-stained Persian wool of every description during the past four years is 4·3 per cent. If I now make a calculation which will favour locks and pieces to the

utmost—i.e., if I assume that every blood-stained fleece is infected, and of the locks and pieces only 4·3 per cent.—even then Bussorah locks and pieces are four times, and Baghdad locks and pieces 2·7 times, as dangerous as the fleeces.

The prevention of " false packing," then, would greatly diminish the risk of contracting anthrax from fleece wool; but how can we expect to find the necessary conscientiousness in Asia Minor or Persia, where human lives are valued so lightly?

The risk in fleece wool would be reduced still further if dangerous fleeces also could be excluded from manipulation. The Regulations provide for this in requiring that the so-called " fallen " and " damaged " fleeces be sought for by men skilled in detecting them, and are to be specially treated. Possibly as the result of a misunderstanding these terms " fallen " and " damaged " appear to be used in the Regulations in a different sense to which they are employed in actual practice. In the wool industry a fleece is considered to be a fallen one when of a peculiar dead lack-lustre appearance—an appearance due to prolonged exposure after the death of the animal. But the longer this exposure the more advanced will be the decomposition of the carcase ; and as the bacillus of anthrax perishes as putrefaction advances, a " fallen " fleece will be less dangerous the more characteristic its appearances are. Similarly, a " damaged " fleece is not a blood-stained fleece, but one that has been damaged by contact with sea-water. Such a wetting will prove dangerous only if the fleece be already anthrax-laden; under the influence of warmth and moisture multiplication of the virus takes place, but from experiments I have made it would seem that the multiplying germs do not pass any great distance—scarcely more than a centimetre into the surrounding wool. Such a restriction to the distribution of the bacilli is possible only when a fleece becomes sea-damaged when in the bale, or otherwise tightly packed. Under other conditions the story is a very different one. Now one of the provisions for laying the dust arising during the opening and sorting, as demanded in certain cases of the Regulations, is steeping. Wool that has been steeped is, however, put so promptly through the processes of washing and drying, that germination of the spores and multiplication has scarcely time to proceed. But one objection to damping the wool is that the detection of blood-stains is rendered difficult. However, this difficulty might be overcome when mohair or white wool is being dealt with. But when wool is steeped loosely and becomes thoroughly drenched, blood-clots are softened, portions of them break away and may attach

themselves to, and so possibly infect, fleeces which had till then been sound. The same will happen when wool is washed unsorted; as the wool leaves the washbowls fragments of clot are caught up, and are once more fixed to the wool in the process of drying. Thus the danger-signal becomes obscured, while the risk of infection, though somewhat lessened, still remains a very real one.

What happens in a wool-combing establishment can happen elsewhere whenever infected wool is steeped or washed. Not all foreign wools reach this country in their natural state. They may have been treated in one of two ways: (1) Some wools, notably many East Indian wools, have been washed—i.e., either tub-washed or river-washed in the country of origin. If the washing be done in running water contamination of healthy fleeces will be much less likely to take place than when the wool is tub-washed. Some of the more dangerous material (mohair) is imported from the Cape, and this fact has recently been commented upon in the Cape Parliament. Whatever steps to lessen the evil may in the future be taken there, it is to be hoped that washing of the material will not be resorted to. (2) The wool may be of the kind termed " skin-wool "—i.e., wool obtained from the hides. In so far as the fellmonger's process is a wet one will the objections mentioned hold good : the traces of blood become obliterated, and the virus becomes diffused. Such is the case with East Indian skin-wool, and with skin-mohairs. But not all skin-wools are of this kind. I find that a dry process is in vogue in Persia. Hence in Persian skin-wools the clots are large, heavy, and readily detected, while in East Indian skin-wool and skin-mohair the stains are faint. In Persian skin-wool, therefore, the presence of blood-clots may fairly be taken as an indication of possible danger, while their absence in the others cannot be taken to promise safety. I can see no other explanation for the fact that I have hitherto failed to cultivate anthrax bacilli from Persian wool other than blood-stained, whereas I obtained them in nearly 20 per cent. of a series of samples of East Indian wool, of which samples only two were blood stained.

Here I may be permitted to digress. It is stated that in the case of China horsehair anthrax bacilli may be cultivated with ease from the dust of most samples, and that hair matted with clots is not often found. As mane-hair is shown to be more dangerous than tail-hair, it has been suggested, in explanation, that the long manes of the horses sweep the ground as the animals are grazing, and pick up the spores with the dust. I have recently been afforded the opportunity of examining eight small

samples of dust shaken from bundles of Chinese horsehair; in six of them I found evidence, both chemical and spectroscopic, of the presence of blood, and from four out of these six I succeeded in cultivating anthrax bacilli.

River-washed wools, then, and skin-wools obtained by wet methods, have this in common, that traces of blood are obliterated and that anthrax spores are liberated ; but there is this difference : Washing is a short process, many spores pass into the stream, and the wool is quickly dried ; the hides, on the other hand, are steeped for twenty-four hours in tanks, where every condition is favourable to the multiplication of the germs. Skin-wool so obtained may therefore be more dangerous than river-washed material.

Here, then, lies the difficulty in the administrative control of anthrax, so far as the wool industry is concerned. In the case of material which has not come in contact with water, and which is of sufficiently good quality to repay the cost of looking over or of sorting, the systematic search for blood-clots appears to me to be indicated. So large a quantity of scheduled material is manipulated daily—some firms will deal in a single day with fifty bales and more, each weighing 3 cwt.—that it is very desirable to reduce as far as possible the bulk of the material requiring special treatment. The detection of blood in wool and hair is easy if the material be white or of a light shade of yellow. Greater experience is required to discern it on naturally coloured wools. Here the sense of touch should prove a safe guide. Dried blood imparts a peculiar harsh touch to the fingers, unlike other substances, such as tar, salve, and excrement, from which the eye alone might find difficulty in distinguishing it. It is remarkable how little risk seems to be run by those who handle blood-stained pieces *knowing the danger*. I can recall no case of anthrax among those who have been most successful in recognizing them. The amount of blood-stained material found is often considerable. I know of a firm which has in eighteen months put aside 2,000 lb. of such. To destroy it might entail a considerable loss, and a commission comber would be particularly loth to put away material the property of another. What is to be done with it? and what can be done to render innocuous wool and hair which may show no outward indication of being dangerous?

The Anthrax Board has made many series of experiments to find some method of disinfection which will ensure the destruction of anthrax spores, which will do so without damaging the wool-fibre, and which shall be commercially possible.

Ordinary press-packed wool is, when in the bale, not amenable to disinfection. The unopened fleece, too, is not very permeable. Chemical disinfectants, such as formaldehyde, cyllin, or kerol, do not penetrate blood-clots in reasonable time, for they harden the outer portions. Much was hoped for from Seymour-Jones's method. Dr. Ponder had reported very favourably upon its power of penetrating artificially infected clots. The solution consists of formic acid and corrosive sublimate; the acid enters the clot in advance of the salt and facilitates penetration by its action upon albumens. But in actual practice the method fails, as the lime and other earthy salts present among the wool quickly neutralize the acid. The same disability attaches to Professor Schattenfroh's method, which consists of an 8 per cent. solution of common salt in 1 per cent. hydrochloric acid. This solution will certainly kill anthrax spores in twelve to twenty-four hours; but so sensitive is the mixture that the use of tap-water in place of distilled water renders it inert. The method is obviously inapplicable. Though formaldehyde (1 in 20), cyllin (2 per cent.), and kerol (2 per cent.) find too great an obstacle in clots, they are of use when the spores are unprotected, as in the case in washed wools, and in skin-wools and hair prepared by the wet method.

Considerable attention has, of course, been paid by us to steam disinfection. In order that the results of the tests might be strictly comparable, we used infected mohair clots only, the clots in Persian wools being generally larger and more dense; and as all the clots were obtained from the same bale, it is reasonable to assume that the vitality of the spores in the various clots was approximately the same. In one series of tests a current of live steam was used. A tank, through the bottom of which the steam was allowed to enter, was packed loosely, but as uniformly as possible, with thirty or forty Persian fleeces. An infected clot was wrapped up in a fleece and deposited in the centre of the pile. Fifteen minutes' exposure to the steam sufficed to sterilize the clot. Tests on somewhat similar lines were also carried out with mohair in a loose state, with like results, so long as the steam had free access. A series of experiments was also made with a Defries's " Equifex " Disinfector, the steam being under a pressure of 5 lb., with a temperature of 232° F., and the time of exposure varying from ten to forty-five minutes. Clots packed in single fleeces were easily disinfected in fifteen minutes. When the infected fleece was packed between eighteen or nineteen others, disinfection was generally accomplished in fifteen to thirty minutes; but a slight addition to the impediments to be overcome—such as turning in the ends of the

fleece containing the infected clot, or the presence of several hard water-damaged fleeces among the pile — would prevent complete sterilization. On one occasion anthrax bacilli could still be cultivated, though very sparingly, after forty-five minutes' exposure.

The results have thus been inconstant. Had the heavier and harder Persian clots been used the results would, in all probability, have been still less satisfactory. The effect on the raw material would alone condemn this method. The lustre of mohair is diminished ; white wool and mohair are turned yellow, and though the average strength of individual fibres is not materially affected, their elasticity is greatly impaired. The material also becomes more harsh, and on being combed produces more noil than does a control sample. In other words, the loss inflicted is a double one ; not only is the quality affected but there is also a loss on the combing and a greater amount of waste. Though disinfection by steam is not practicable in bulk, there is no reason why it should not be used for the sterilization of blood-clots removed in the sorting ; their daily quantity is small, little time is taken up by the process, and the amount of blood-stained wool so treated would be relatively so small that when sterilized it could be mixed once more with the rest of the wool without affecting the combing or spinning qualities of the whole.

Steam disinfection, particularly when steam under pressure is made use of, has one other drawback : blood-clots become still more firmly fixed and the blood pigment undergoes changes, probably in the direction of hæmatoporphyrin, which make its removal very difficult. In the case of the darker, naturally coloured wools this difficulty may not matter greatly, but in that of white wools it would be a very disturbing element. As time is of no great moment when clots alone are to be treated, it may prove worth while to steep these in warm water over night. They will be softened partly by the water itself and partly by the action of the numerous liquefying bacteria which abound in all wools. When softened in this way the clots must not be steamed, else the wool is rendered quite useless ; but disinfectants will now penetrate easily and do not appear so readily to harden the albumen of these clots.

When the time is ripe for the much-needed revision of the wool-sorting and combing regulations many of the alterations will no doubt be based upon the knowledge and experience gained by the Anthrax Board during the last six years. But there is one reform the necessity for which must be obvious to anyone with an observing eye and an open mind who visits these factories. Many workers have at present

to handle the wool to a quite unnecessary extent. There is the wash-bowl-feeder, stooping down over the pile of wool at his feet as he is about to lift it on to the feeding-lattice with his face nearly buried in the wool, and there is the card-feeder exposing himself to risk in a similar way. I have seen men enter the chamber into which the willeyed wool has been blown and gathering up armfuls of the wool, throw it into large sheets nearly on a level with their mouths—their head, face, and neck becoming covered with wisps of wool in the process. Surely it cannot transcend the ingenuity of man to devise some method of mechanical convection from one machine to another.

For well-nigh forty years has this problem, the prevention of industrial anthrax, exercised us in Bradford. No one can say that it is satisfactorily solved to-day. But when the solution that has eluded us so long shall at length have been found, it will have been not the work of one man, but the result of the co-operation of the experts in the trade.

DISCUSSION.

The PRESIDENT (Dr. W. H. Hamer) said the Section would wish to thank Dr. Eurich for a very interesting paper; he had helped those who did not know the conditions under which wool was manipulated in Bradford to understand more fully why it was that the ravages of anthrax there were of a different nature from those observed in other cities. In the days when there were no medical inspectors at the Home Office it fell to the lot of the medical officers of the London County Couucil to make investigations with regard to anthrax, and many years ago he collected the records of 119 cases of the disease which had occurred in London. He had been comparing the sites of pustulation in those cases with the sites in the cases observed by Dr. Eurich. The sites in external anthrax corresponded closely in the two sets of cases; but in the internal form of the disease there was a difference in the percentages, for whereas the author had nineteen internal cases out of 110, in the London series there were only two such out of 119. He had always wondered how it was there was such a difference between the two cities in that respect, but the lantern slides now shown enabled one to see and appreciate more fully the reason; the infected material was dealt with in a different way. He always felt depressed when he heard papers on anthrax, because it seemed to him extraordinary that a piece of preventive medicine work which should be so simple of accomplishment had never yet been satisfactorily carried out. Dr. Eurich had clearly shown that the mischief was wrought by a

comparatively small quantity of material, and that had been the experience of all who had worked at the subject of anthrax. Dr. Russell, when he investigated the outbreak in a horsehair factory in Glasgow, pointed out that it was a small quantity of material which was dangerous in this respect, and the same point was made when Dr. Spear, for the Local Government Board, investigated a series of cases which occurred from manipulating China hides in Bermondsey in the eighties. A number of cases occurred in London in the nineties, due to the manipulation of goat-skins from a particular source. Bearing these facts in mind, it seemed extraordinary that nothing more effective in the way of prevention of the disease should yet have been accomplished. M. Chauveau read a paper before the Seventh International Congress of Hygiene in 1891, in which he pointed this fact out, and he argued that it was only by convincing those concerned with the disposal of raw material to which suspicion attached, that to destroy it was the only course open to them in order to safeguard their own interests, that it would be possible to exercise an efficacious check upon the disease. He (Dr. Hamer) thought members might well take that expression of opinion to heart, and he hoped that papers like the present one might have the effect of influencing opinion in this connexion.

Dr. T. M. LEGGE said he also felt grateful to Dr. Eurich for the practical nature of his paper, and for the helpful suggestions he had made for the inevitable revision of the Home Office Regulations to which he had alluded. He agreed with the President that it seemed extraordinary that a disease which caused only sixty or seventy cases per year in factories and docks, of which about fifteen were fatal, should cause so much anxiety, and should in Bradford be considered as a scourge. But he thought there seemed to be in the anthrax bacillus something almost occult. For instance, it was extraordinary that pulmonary anthrax should practically be limited to the wool industry. He did not agree that it was due to the different nature of the processes ; there was the same amount of dust in a hide-skin warehouse in Tooley Street as in a Bradford sorting house. Dr. Russell's classical cases in Glasgow in 1878 were cases of internal anthrax from horsehair, but since then he could not recall more than one or two cases of pulmonary anthrax in horsehair workers in this country, though there had been cases abroad. It was not that such cases were not being looked for, because at Guy's Hospital a case of internal anthrax would not be overlooked. The work of the Anthrax Investigation Board was one of the most signal things in industrial progress in this country. That a body of manufacturers should band themselves together, as they had done in Bradford, to try and get rid of the evil, was a most praiseworthy thing, and it was the kind of effort which he would like to see adopted in other districts, so as to minimize the incidence of industrial diseases. In Bradford the determination had been to work on scientific lines. He was present at the first meeting of the Board, and since then the work they had done had quite changed current views about the spread of anthrax.

Dr. Eurich had alluded to the importance of the blood-clot, and the conception of that as the great danger, and hence the need for its removal. This was found to be a much greater danger than the dust. Dr. Eurich's work in the examination of a great many samples of dust from the worsted factories, from which he rarely cultivated anthrax, caused him to turn his attention to the examination of the clots, and in some of them he found from 10 to 20 per cent. infected. A thing which had puzzled him was the following: Seeing that it was the workers' fingers which always came into contact with the wool, it was astonishing that he should have had only one report of a case in which the finger was affected. Did Dr. Eurich think the explanation lay in the frequent washing of the hands? Or was it because there were no hair-follicles on the palms of the hands, and therefore no chance of spores lodging there? Further, did Dr. Eurich think that if a spore lodged in a hair-follicle, or a sweat-gland, and worked its way down a little, a pustule might develop without an abrasion at the site? His own view had been that an abrasion was a necessary condition precedent to such development. Reference was made in the paper to Sclavo's serum, and he would like to hear whether the author had information as to other serums. Sobernheim's serum he knew was being used for treatment in Germany; it was a serum from sheep, whereas Sclavo's was from the ass. The dose of the German preparation was much less than Sclavo's. He had read of a serum being used on a large scale in the Argentine Republic, and the dose of that was even smaller than that of Sobernheim's. Dr. Eurich stated that if an operative who was infected refused the serum, he should be offered a vaccine. Had the author thought of the idea of using the serum as a prophylactic inoculation? Perhaps a much smaller dose than for treatment would suffice for this. This suggests itself in the case of the workers at the factories known to be handling specially dangerous wools. Possibly the operatives might express their dislike of this, but if it were very carefully and tactfully explained to them, their objections could be overcome, just as Dr. Eurich had taught them to give a proper danger value to the blood-clots, a matter which five years ago would not have been thought of. He knew that such prophylactic inoculation had been done, certainly once, in India. Dr. Lingard, in a severe outbreak in a jail in which prisoners were manipulating wool, had nine cases of what he called " anthracæmia," probably meaning pulmonary or erysipelatous anthrax, because he differentiated those cases from malignant pustule. After there had been three fatal cases he used a serum which he prepared for animals in his own laboratory. Of the nine cases which he commenced to treat in that way five recovered, four died, and in the latter the life was a good deal prolonged by the treatment. The important point was that there were sixty men who had to clean out and disinfect the wool-sheds subsequent to the outbreak, in which work, of course, they ran great peril. As a prophylactic, Lingard inoculated 5 c.c. of his serum into each worker, and one case only suffered from anthrax, and that only in mild degree. There seemed to be possibilities for good in it. In conversation, Professor Sclavo agreed that

prophylactic inoculation might serve the purpose. What Dr. Eurich said, and what had been generally noticed, on the question of dust, made one think the question had been somewhat neglected. Exact dust determinations had recently been made for the Home Office, stating the results as milligrammes per 10 c.m. of air, by Mr. Duckering, H.M. Inspector of Factories at Birmingham, who had had much experience in the metal-grinding, painting, and pottery industries. He had informed him (the results had not yet been published) that the amount of dust in wool warehouses was much greater than in any of the factories in the industries he had previously inquired into. And it was surprising how much vegetable matter, as well as mineral matter, there was in the wools. But the mineral matter in wool factories, when examined microscopically, was found not to consist of spicular and angular fragments, but of more or less rounded particles, thus presenting a contrast to metal-grinding dust. And so far as he was aware, the workers in wool factories did not complain particularly of affections of the lungs.

Dr. COLLIS said he did not pretend to much knowledge on anthrax, for all the time which was at the disposal of the Department had been devoted by Dr. Legge to the anthrax question. That the disease was of interest to others besides those concerned with occupation disorders was once brought home vividly to him. A friend of his, whose father was connected with the horse-hair trade, and who was therefore familiar with the appearance of an anthrax pustule, was dressing for a surgeon at hospital when a man came with a curious sore on the face, and the surgeon sent him to the house surgeon in the next room to excise it. But the dresser thought that, notwithstanding the black centre, it did not look quite like an anthrax sore, so he slipped back and made one or two inquiries of the patient, who proved to be the father of a baby who had recently been vaccinated, and the operation was successfully abandoned. He had thoroughly enjoyed hearing the paper and seeing the instructive photographs.

. Dr. CROOKSHANK asked whether much was known about anthrax as it occurred in its natural state amongst animals in South Africa and South America and other countries. He noticed that most of the workers shown in the photographs were obviously men in the habit of shaving, and wondered whether the liability to inflict cuts on themselves when shaving increased the risk of getting the disease.

Mr. MAJOR GREENWOOD, jun., said he was interested in the question of cutaneous irritation precedent to contracting the disease. Dr. Legge raised the question as to the possibility of infection through the unbroken skin. Was there a different degree of irritation in the various phases of the process of manufacture, and, if so, did such difference have any relation to the case-rate.

Dr. EURICH, in reply, said, with regard to the comparison of the internal cases of the disease at Bradford with those occurring elsewhere, it was a question whether the difference was due to these internal cases not having been recognized elsewhere. In tanneries, for instance, one could understand pulmonary cases being rare, because hides were dealt with in the wet state, and there was not much dust. In the felt industry in Lancashire, during the last eight or nine years there had been twenty-one or twenty-two cases of anthrax, and, in spite of the fact that much more dust was associated with the felt industry, not one case of internal anthrax had been reported in connexion with that industry. That industry also dealt in East India wool, and he did not know why Bradford and district should have internal cases of anthrax while the felt industry had none. He agreed as to the rarity of anthrax pustules on the fingers; he had seen it there only twice, which was a very small proportion of the total number of cases. His view was that scratches and pimples did not play such an important part in the development of anthrax as his predecessors believed. Anthrax had been experimentally produced by rubbing infected material on to the skin; and he had been struck by the frequency with which the site attacked proved to be a surface where friction operated, such as where the hat fitted on the forehead, the neck, and the wrist. But those were also common sites of pimples. Still, one or two cases were traceable to injury. One case was traceable to a prick from a thorn in the wool; in another case the man pricked his wrist with a " faller," one of the sharp needles of a preparing machine, and anthrax developed twenty-four hours later. Of course, shaving the face might increase the liability to infection, but it was difficult to determine that, as there were so few bearded men doing the work. Possibly one or two of the pustules on the lips which he had seen were due to the shaving. Still, one occurred in a man who wore a moustache. He had at home some samples of Sobernheim's serum, but he had had good results with Sclavo's serum, so good that he hesitated to try a fresh kind. For immunization purposes the number of people who would have to be inoculated was large, and the immunity so produced would be but short-lived. He could understand it doing good in the jail mentioned by Dr. Legge, where the dangerous work would probably not last long. But in the Bradford industry the work was continuous, and one never knew when an infected bale would be opened. Seeing how often the serum would have to be administered, there was a danger of anaphylaxis occurring. To prevent anaphylaxis the only safe plan would seem to be to alternate the two sera. As a prophylactic, probably the efficacy of the serum would be greater when combined with a vaccine. Still, he questioned whether the worker would submit to it. The classification of these diseases, or many of them, in foreign countries was very unsatisfactory. He had derived the impression from reading, and the same was said by Dr. Bell, that many diseases which were called anthrax were not that condition; while, e.g., many cases called plague were probably anthrax. Also, the veterinary inspection in those countries was by no means ideal. Still, it was to be hoped that our

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Consular bodies would be interested in the question, and send home regular reports. He was much interested in Dr. Collis's speech, and the mistaking of a vaccination pustule for one due to anthrax. The same thing had happened to himself; he was called in to see a woman who had a pustule on the chin. She did not work in a wool factory, but her doctor thought she had been infected from having worn another woman's shawl. He (Dr. Eurich) asked how the baby was, and learned it was recently vaccinated. There was no anthrax in the pustule. Careful inquiry should be made into the duration of the pustule. The fifth day of an anthrax pustule looked like the pustule of vaccination at the ninth or tenth day. Workers in scheduled materials had instructions to inform the foreman as soon as there was the appearance of a pustule, or a prick, but many were very careless about themselves. At all these factories there were means and facilities for dressing wounds. In some cases the sufferers had neglected the foreman's recommendation to seek medical advice. Here, as elsewhere, familiarity too often breeds contempt.
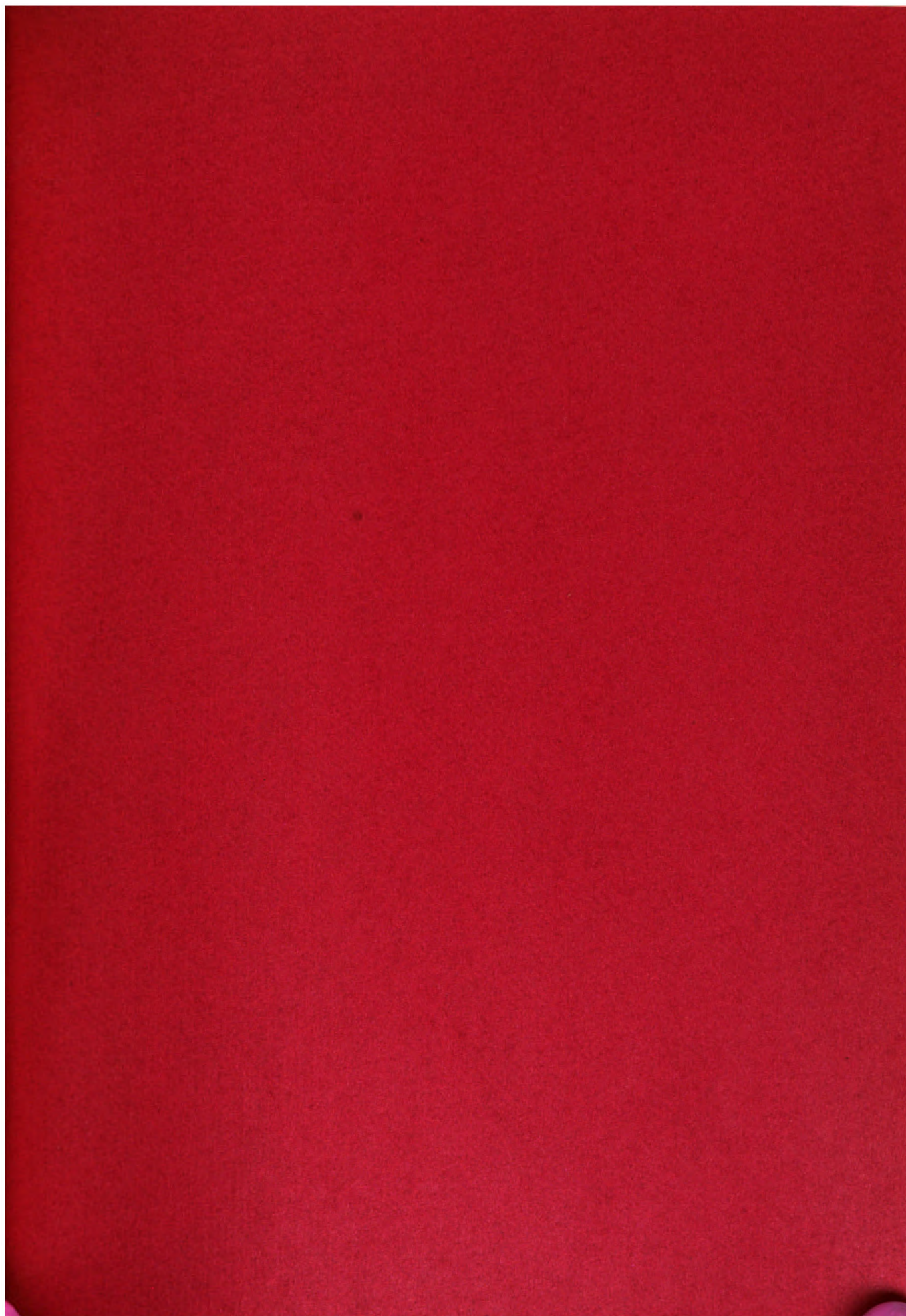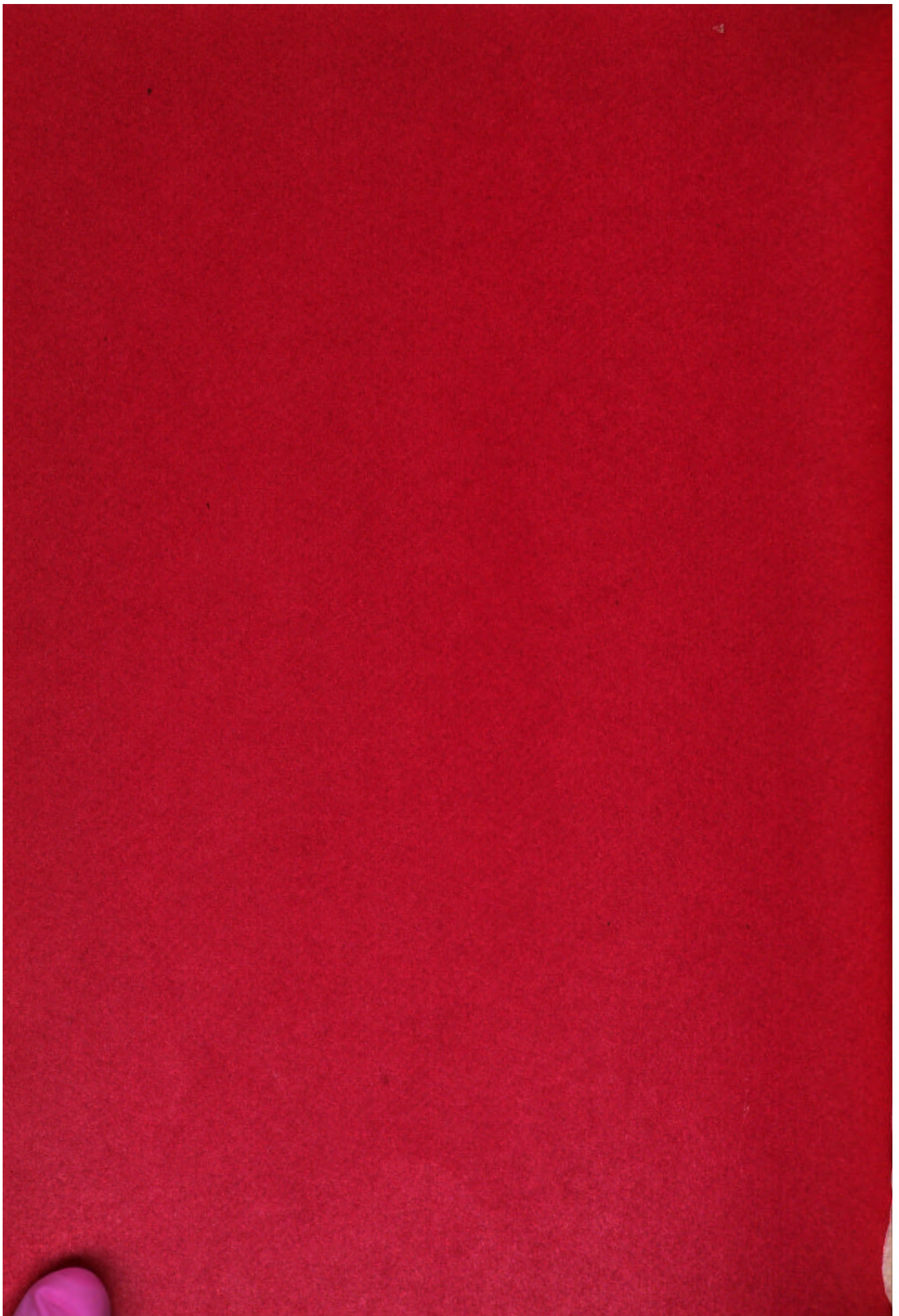
Section of the History of Medicine.

November 20, 1912.

Sir Wm. Osler, Bt., F.R.S., President of the Section, in the Chair.

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President's Introductory Remarks.

In thanking the members of the Section for the honour of election as their first Chairman, Sir William Osler remarked that he had at least two qualifications—a keen interest in the subject, and a certain academic leisure, which would enable him to attend to the duties of the position. Physicians held very different views on the subject of the history of medicine. A majority were indifferent—too busy to pay any attention to it ; a considerable number were interested enough to read articles, or to listen to papers ; then there were the amateur students, like himself, who dabbled in history as a pastime ; and, lastly, there was a select group of real scholars, men like Adams, Greenhill and Payne. It was to be hoped that this Section would form a meeting ground for the scholars, the students, and for all those who felt that the study of the history of medicine had a value in education.

He felt sure, from the number of men who had sent in their names, that it would prove to be a useful working section. There was much to be done, for example, in British medicine in continuation of the good work of Payne, Norman Moore and D'Arcy Power. The Section might encourage educational work, and it would be easy to arrange courses of lectures by experts in Egyptian, Babylonian, Greek and Roman medicine, which would prove very attractive to senior students, and to young practitioners. At each meeting demonstrations of books, &c., could be arranged to illustrate some special phase in the evolution of medicine.

He would ask the members of the Section to take a special interest in the Library of the Society. Though large, and rapidly growing, there were many lacunæ, particularly in the choice editions of the works of the great masters of the profession, and he would suggest that by

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special subscriptions among the members and Fellows, as occasion offered, such books should be bought.

And, lastly, the members were reminded of the Historical Section of the International Medical Congress next year, and urged to help to make it a great success.

A Down Survey Manuscript of William Petty.

Note by Sir WILLIAM OSLER, Bt., M.D., F.R.S.

SIR WILLIAM PETTY (born 1623, died 1687), for a short time Professor of Anatomy in the University of Oxford and Vice-Principal of Brasenose College, has outlived the somewhat slender reputation he had in the profession; and yet in one particular he deserves to be held in remembrance among us for his share in Graunt's " Bills of Mortality of the City of London," 1661, the first work of the kind in English, and for his " Observations on the Dublin Bills of Mortality," 1683. As a political economist his praise is in the schools. In the " Treatise on Taxes and Contributions " (1662), the " Discourse on Political Arithmetic " (1691), the " Political Anatomy of Ireland," and in certain minor tracts, students find the beginnings of that science in these islands. Before Petty no one had tried accurately to estimate the money value of the individual life to the nation, the importance of the division of labour, and the real nature of wealth. Let me quote one sentence from " Verbum Sapienti " (from the 1691 edition, p. 14) :—

" For Money is but the Fat of the Body-Politick, whereof too much doth as often hinder its Agility, as too little makes it sick. 'Tis true, that as Fat lubricates the motion of the Muscles, feeds in want of Victuals, fills up uneven cavities, and beautifies the Body ; so doth Money in the State quicken its Action, feeds from abroad in time of Dearth at home; evens accounts by reason of its divisibility, and beautifies the whole, altho more particularly the particular persons who have it in plenty."

You will not wonder that the Cambridge University Press reprinted his economic works, 1899 (edited by C. H. Hull) when you hear the following extract from Lord Edmond Fitzmaurice's " Life," 1895 :—

" In the ' Treatise on Taxes,' with an eye still fixed in the same direction, he begins by pointing out that the only legitimate public charges of the State

are, its defence by land and sea so as to secure peace at home and abroad, and honourable vindication from injury by foreign nations; the maintenance of the chief of the State in becoming splendour, and of the administration, in all its branches, in a state of efficiency ; ' the pastorage of souls by salaried ministers of religion ' ; the charge of schools and universities, the endowment of which, in his opinion, ought to be a concern of the State, and the distribution of whose emoluments ought not to be ' according to the fond conceits of parents and friends,' and of which one of the principal aims should be the discovery of Nature in all its operations ; ' the maintenance of orphans, the aged, and the impotent,' for, in his opinion, ' the poor can lay up nothing against the time of their impotency and want of work, when we think it is just to limit the wages of the poor ' ; and the improvements of roads, navigable rivers, bridges, harbours, and the means of communication, and the development of mines and collieries."

But Petty has a third claim to remembrance as the author of the famous Down Survey of Ireland—which "stands to-day, with the accompanying books of distribution, the legal record of the title on which half the land of Ireland is held " (Larcom). The text of my few remarks is an interesting manuscript relating to this work which chance threw in my way. In 1649 Petty had been named Deputy to Dr. Clayton, the then Regius Professor of Medicine at Oxford, and in 1651 succeeded him in the Chair of Anatomy. At Oxford he became an active member of the Club or Society, out of which originated the Royal Society. In 1652 he was appointed Physician-General to the Forces in Ireland, with which country the remainder of a stormy life was to be associated. A masterful, energetic, resourceful man, the first thing he did was to reorganize the Medical service. Energy in action was, he said, the great requisite of life, and soon an opportunity offered which called forth all his powers. In 1652 the Irish were conquered— the English won, and as Petty says, " had amongst other pretences a Gamester's right at least to their estates." The claimants were (1) : The adventurers in England to whom 2,500,000 acres of Irish land had been pledged for money advanced to raise an army ; (2) the soldiers of the New Model Army of Cromwell and Fairfax, who had really done the fighting ; and (3) the Commonwealth, which had reserved the Crown and Church, and certain other lands. There were, it is said, 35,000 claimants of land in all. Lots were drawn, and attempts were made at the distribution, but it was found impossible to identify the lot drawn with any particular parcel of land. There was no survey, and matters were soon in a hopeless muddle. The Surveyor-General, also a doctor, a visionary, unpractical man, insisted that a survey could not be made in less than thirteen years. Petty, a strong critic of this scheme, undertook

to finish the job in thirteen months, if given a free hand. Registers and valuation lists existed in places, but no maps; Petty agreed " to survey, admeasure and to map," and so his work came to be known as the " Down " survey, because it was surveyed *down* on a map. The date fixed was February 1, 1655, and the rate of payment agreed upon was £7 3s. 4d. per 1,000 acres of forfeited profitable land, and the Church and Crown Lands at £3 per acre. It was a vast undertaking, but Petty had a genius for organization, and was himself a practical surveyor as well as a mathematician and physicist of the first rank. We get a glimpse of the way he went to work from a contemporary account :—

" The said Petty, consideringe the vastnesse of the worke, thought of dividinge both the art of makeinge instruments, as alsoe that of usinge them into many partes, viz., the one man made only measuringe chaines, vizt. a wire maker ; another magneticall needles, with theire pins, vizt. a watchmaker ; another turned the boxes out of wood, and the heads of the stands on which the instrument playes, vizt., a turnor ; another the stands, or leggs, a pipe maker ; another all the brasse worke, vizt., a founder ; another workman, of a more versatile head and hand, touches the needles, adjusts the sights and cards, and adaptates every peece to each other."

In the meantime scales, protractors and compass cards were prepared by the ablest artists in London, whither also were sent for, to use the old expression, " a magazine of royal paper, mouth-glue, colours, pencils," &c. Field books were prepared, and the ablest men in each barony and parish were selected as helpers. A staff of 1,000 persons was organized with forty clerks at headquarters and an army of surveyors and under-measurers. By April, 1656, the greater part of the special work assigned was finished, and he had surveyed for the army about 3½ millions of acres. Subsequently he undertook the survey of the adventurers' lands, a task which occupied his time until nearly the end of 1658.

As Sir Thomas Larcom, the historian of the survey, remarks :—

" It is difficult to imagine a work more of obscurity and uncertainty than to locate 32 thousand officers, soldiers and followers with adventurers, settlers of every kind and class, having different and uncertain claims, on lands of different and uncertain value, in detached parcels sprinkled over two-thirds of the surface of Ireland."

But this is the task Dr. Petty successfully accomplished. The MS. which I show deals with the survey and was bound at the back of two volumes of Petty's letters, which I bought at the sale of the Phillips MSS.

in April, 1911. The numerous manuscripts relating to the survey are in the possession of the Lansdowne family (descendants of Petty) in the British Museum, and in the Public Record Office in Dublin. This manuscript has two points of interest: A copy, in Petty's hand, of the contract, dated Dublin, May 18, 1655, signed by Charles Fleetwood on behalf of the Council of Officers. This has already been published in Larcom's book. But the greater portion of the MS. is occupied with private memoranda concerning the detailed cost of the work of the survey. These, I am informed by Mr. Mills, of the Public Record Office, Dublin, "have not been known to Sir Thos. Larcom, Hardinge, or Lord Fitzmaurice, when writing on Petty's work. They should be of interest to any future writer on Petty's life or his great work."

In reading Petty's life and works, one gets the impression of a man born out of due time. His ideas, and the practical capacity and energy with which he carried them into execution, suggest the twentieth rather than the seventeenth century. No one of his writings shows the man in a better light than a little tractate on education, "Advice of W. P. to Samuel Hartlib for the Advancement of some particular Parts of Learning" (London, 1648). He suggests the establishment of "ergastula literaria," literature workshops where children may be taught to do something towards their living as well as to read and to write ; and he would have all children, though of the highest rank, do "some gentile manufacture in their minority." He also urged the establishment of a college of tradesmen—a technical school, "Gymnasium Mechanicum"—"to which one prime and ingenious workman of each trade should be appointed a Fellow."

Of special interest is his advocacy of a "Nosocomium Academicum," or a hospital to cure the infirmities both of physicians and patients. It is the first suggestion I know of a research hospital. And he lastly urges the formation of a society, which will be "as careful to advance Arts as the Jesuits are to propagate their Religion"—which indicates that he had in mind at that time the organization of the Royal Society.

Pepys, in the celebrated "Diary," has many notices of Petty, who, he says, "In discourse is methinks one of the most rational men that ever I heard speak with a tongue, having all his opinions most distinct and clear"—a judgment amply confirmed by all those who have studied the writings of this remarkable man.

Contributions from the History of Medicine to the Problem of the Transmission of Typhus.

By RAYMOND CRAWFURD, M.D.

IT is, of course, a matter of general knowledge that the flea is one important agent in the conveyance of the bacillus of plague to man, but it is less generally known that both French and American experimenters have succeeded in communicating typhus from man to certain animals by the agency of the body-louse (*Pediculus corporis* or *Pediculus vestimentorum*). We may reasonably infer from the acute self-limited course of the fever, and from the almost complete immunity conferred by an attack, that typhus also, like plague, is caused by a specific microorganism, and perhaps this parallelism with plague in the mode of communication may be regarded as corroborative evidence of this inference. As the conditions favourable to the multiplication and activity of the flea and the body-louse are in most respects identical, one would expect to find a high degree of similarity in the epidemicity of the two diseases, in any region in which both diseases are known to occur ; and conversely any differences of habits of life of the two parasites should be reflected in differences of epidemic prevalence. We will endeavour to see to what extent the history of medicine confirms these two propositions.

There is scarcely a single writer of the sixteenth, seventeenth, or eighteenth centuries on the subject of fevers who has not commented on the concurrence of malignant fevers with epidemics of plague. It is true that they do not all identify the malignant fevers as typhus, simply because the identity of typhus, though established by Fracastorius as early as 1546, did not become generally recognized throughout Europe until the eighteenth century, and even then its identity was obscured under a multiplicity of synonyms. Short, writing in the first half of the eighteenth century, commented on the great affinity between plague and spotted fever, then the general name of typhus, and gave a list of eighteen recent epidemics, in which one had turned into the other. Mead also had laid it down that " Fevers of extraordinary malignity are the usual forerunners of plague," and Hancock, in 1821, asserted that nearly all the most remarkable plagues of the last two centuries had been preceded by typhus. He might have added relapsing fever as well,

for there was seldom an epidemic of typhus without a simultaneous outbreak of relapsing fever. We have recently obtained the explanation of this close association of typhus and relapsing fevers in the successful transmission of relapsing fever, also by the agency of body-lice.

Bearing in mind this close and constant association of acute infectious fevers, it is easy to understand how it came about that medical men conceived that all fevers were essentially the same, differing from one another not in kind, but only in degree. Lord Bacon had observed the association, for he wrote, " the lesser infections of small-pox, purple fever [typhus], agues, &c., in the preceding summer, and hovering all winter, do portend a great pestilence the summer following. For putrefaction rises not to its height at once." But these are mere general statements, and we need to examine the specific occurrences upon which they are based. These are so numerous that it is only possible to cite the most important. Villani, in his "History of Florence," says that a sort of sickness, which always follows famine, fell on the poor of Florence the year before the Black Death. Ambroise Paré, in 1568, described a pestilential fever as prevailing in France along with true plague, in which the skin was marked with spots like the bites of fleas or bugs. Vilalba says that on several occasions during the sixteenth century a spotted fever, called tabardiglio, which is now known to have been typhus, prevailed in Spain along with plague, and was much confused with it. Lotz says that in 1624 a malignant spotted fever prevailed in London, which, in 1625, turned to the plague, and in 1626 back again to spotted fever. Similarly Sydenham says that the Great Plague of London was preceded and followed by a pestilent fever, which from the description he gives was clearly typhus, and he remarks that it differed from the plague only in the milder character of its symptoms. Boghurst says that many had spotted fever and plague at the same time, and the Bills of Mortality show a great increase of deaths from fever coincidently with the plague. The records of Lotz and Sydenham are only two of many which testify that typhus was apt to linger on *after* plague disappeared, as well as to *precede* it. According to Diemerbrœck, spotted fever preceded plague in Holland in 1636, and its malignity increased progressively, until finally it became converted into true plague. The plague of Vienna in 1679 was preceded by an epidemic of " Hitzig-Krankheit," which was far too fatal for relapsing fever, and was therefore almost certainly typhus. Mead and other medical writers admit that a fever of extraordinary malignity prevailed in Marseilles, in 1720, before

the arrival of the ship that was held to have brought the plague; indeed, the physicians at Leghorn had actually decided that the fever aboard the ship was malignant pestilential fever and not plague. Russell states that the plague of Aleppo, in 1760, was preceded by a malignant petechial fever, which was almost as fatal as the plague; and Mertens says the same of the plague of Moscow in 1771. It is useless to multiply further examples of the almost constant concurrence of typhus and plague in the great epidemics of former centuries. We are now in a position to appreciate how it came about that at the outset of almost every great epidemic of plague acrimonious controversy raged among physicians as to whether the disease were plague or no. And the confusion becomes still more intelligible when we consider the similarity of the general symptoms, and that typhus patients were not infrequently affected with buboes. Murchison found these in as many as 2 per cent of typhus patients in some epidemics. It also gives us pause in accepting without reserve the habitual assertion of present-day physicians, that the manifestations of plague are atypical at the commencement of an epidemic.

Now, are there any circumstances in the life-history of the flea and the louse that will explain the tendency noted by these various writers for typhus to precede plague in its appearance? I think there are. Practically all the epidemics of plague cited above were at their height in the summer months, when the propagation and activity of the flea are at a maximum. Now the body-louse, as it adheres closely to the human body and clothing, is independent of seasonal change in its activity, so long as its habitation is undisturbed. But disturbance of its habitation *does* occur, and chiefly in the summer months, when cleanliness and changes of clothing are at a maximum, whereas in winter these phenomena are apt to follow the thermometer closely in its approximation to zero; and coincidently with this the desire for warmth induces overcrowding, with increased facilities for the transmission of lice from man to man. Logically, then, we should expect the two diseases to concur, but with plague at its maximum in the European summer, and typhus at its maximum in the European winter, and this has actually been the case.

Of the rôle of clothing in the carriage of typhus there is no doubt, for Murchison says that the porters engaged in handling, and the nurses engaged in washing, the clothing and the bedclothes of the patients in the London Fever Hospital were so frequently attacked with typhus that it was next to impossible to get persons to undertake the tasks.

The body-louse clings by preference to the clothing, and only transfers itself to the human body at meal-times.

I would suggest, too, that in cleanliness and change of clothing is to be found the explanation of the fact that typhus is virtually unknown in Tropical Africa. The *Pediculus capitis* and *Pediculus pubis* are common enough in West Africa, but the *Pediculus vestimentorum* is as rare as native clothing is scanty. I am told by an experienced West African doctor that he has never seen *Pediculus vestimentorum* there, except imported on the persons of Syrian traders—eloquent testimony to the fact that man is clean, until he is civilized. On this assumption, too, a fact recorded by Bancroft, Lind, Trotter, Hildenbrand, Jacquot and Murchison becomes explicable, that the naked slaves in infected slave-ships were immune from typhus. It cannot be an instance parallel to the immunity of the Arab from typhoid, for nakedness was a condition of the immunity, which did not extend to those who were clothed. Murchison found from an analysis of 18,268 cases of typhus admitted to the London Fever Hospital in twenty-three successive years, that the largest number were admitted in winter and spring, and the smallest in summer ; and also that in a protracted epidemic there was habitually a fall in summer and autumn, followed by an increase on the approach, and especially after the persistence, of cold weather. Converting these facts into terms of our hypothesis, we have it that typhus is most common when cold produces the uncleanliness and overcrowding that favour the activity and dissemination of body-lice.

Of the relation of typhus with overcrowding it is hardly necessary to speak. Murchison located the residence of 26,380 typhus patients in London, and showed beyond all doubt that the incidence of typhus was directly proportional to the degree of overcrowding. No less than 95 per cent. of these were destitute, and had either drifted into workhouses or were dependent on parochial relief. In seventeen years Murchison saw only six typhus patients in his private practice among the well-to-do, and three of these had been brought by reason of their occupations into close and constant contact with the destitute poor. Murchison's experience in this respect was more than confirmed by that of Sir W. Jenner and Dr. Tweedie. Those, then, who were clean and not overcrowded did not become infected. This also suggests a limited mobility of the virus of typhus, which at the same time is intensely virulent at close quarters. Very few of those in immediate contact with the patients, such as the nurses, porters, and resident medical officers, at the London Fever Hospital, escaped an attack of typhus. Other fevers such as measles and

scarlet fever tend to arise under the same local conditions of squalor as typhus, but they quickly spread far and wide, independent of these initial influences, whereas typhus remains localized.   The relative mobility of the flea and the louse is probably of secondary import-ance, for the power of locomotion of the louse is commensurate with that of his host, man.

We may pass on now to consider whether the general conditions which our medical predecessors believed to be most favourable for the prevalence of typhus were such as to suggest transmission by the agency of body-lice. Murchison, in his masterly treatise on "Continued Fevers," has classified the various synonyms of typhus fever, the greater number of which were derived from its prevalence in *camps* and *gaols*, and a less number from its prevalence in *ships* and *hospitals*.   One physician, Laycock (1861), went a step further and coined the name "ochlotic fever" (ὄχλος = a crowd), to indicate that overcrowding was the common factor underlying its prevalence in these various situations. Let us consider what justification facts afforded for the nomenclature.

First, as to camps and armies :   Andreas Gratioli, in 1576, described an epidemic of typhus that devastated the army of Charles V during the Siege of Metz.   Forestus, in 1594, recorded an outbreak during the wars in Holland between the Dutch and the Spaniards at the end of the sixteenth century.   Sennertus, in 1619, and many others described it as *morbus castrensis* or *morbus Hungaricus*, when it broke out in the army of Maximilian II in Hungary, and spread thence all over Central Europe. Rhumelius, in 1625, spoke of typhus as *morbus qui ex castris in Bavariam penetravit :* this outbreak originated among the confederate troops at Wiedhausen, and spread over the whole of Bavaria.   Various writers term it *pestis bellica* or *Typhus bellicus*.   Thomas Willis, in 1679, gave the name *febris castrensis* to the typhus that raged during the Civil War in Oxford, where he was studying medicine, and Haller in 1742 followed his lead.   Petri, in 1665, used the name *febris militaris ;* Brandhurst, in 1746, *febris castrensis petechialis epidemica ;* Sauvages, in 1759, *Typhus castrensis ;* Grant, in 1775, *camp fever ;* Hufeland and Russ, describing the epidemic in Russia and Poland during the campaign of 1806-07, *die Kriegspest ;* and Louis, in 1829, *Typhus des camps et des armées*.

Typhus was rampant everywhere in the wake of Napoleon's armies, and notably during the retreat from Moscow, when his soldiers were infested with vermin ; but its greatest havoc has been wrought upon beleaguered garrisons.   In times of war it has often been epidemic in

places in which it did not occur in times of peace. This was the case in the Crimea. The first epidemic of typhus, in the winter of 1854-55, fell chiefly on the English, whose commissariat and lodgment were then far inferior to those of the French; but in the following winter the conditions were reversed and the French suffered most. On the condition of the English troops in the first year of the campaign I am able to supply some valuable and graphic evidence from letters which I have received from two veteran Army medical officers—Sir Anthony Dickson Home, V.C., and Sir R. J. Jackson. The former writes, under date September 23, 1912: "I have not a word to withdraw in my statement that everyone in the *first* year of the Crimean War was infested by an indescribable plague of lice: it was common knowledge in the camp —officers and men— but the epidemic passed off within two or three months, when fresh clothing became available." Sir R. J. Jackson writes, under date September 25, 1912; " Soon after our arrival in the Crimea, Staff-Surgeon W. Maclise, who had been my predecessor in the 90th L.I. — a brother of D. Maclise, the famous painter. W. Maclise had been in the Alma, and when visiting his old corps before Sebastopol, stated that his shirt was so lively with lice that it accompanied him on the march. The men were seriously infested with vermin, and, as water was scarce, I have seen the men ironing their clothing by rolling a 32-lb. shot over the garment placed on a flat stone. I know that some of the officers also suffered. I don't know whether the Russians were similarly affected, but after they were driven out of the Redan I visited some of the casemates; these swarmed with fleas, and I had quite a garrison about me when I returned to camp." Dr. Douglas A. Reid, another veteran, tells me that when he arrived early in February, 1855, the pest had abated so as not to attract notice specially, and he ascribes the abatement to the discarding of the old clothing, when new was issued. All the medical writers—English, French and Russian — express the single opinion, that overcrowding was the exciting cause of the typhus, and that the effects were most disastrous, when the rigour of the Russian winter encouraged further overcrowding, for the sake of warmth. Overcrowding will, of course, facilitate the transference of lice from man to man, but the impracticability of personal cleanliness and of changing or cleaning the underclothing, and the necessary interchange of bedding, must have been factors, in time of active warfare, at least as important as over-crowding. The Black Hole of Calcutta, in 1756, had shown

sufficiently that no degree of overcrowding could alone produce typhus, and, conversely, typhus had often fastened on armies in the open air and on the move. During the Egyptian, Sudanese and South African campaigns the troops were abundantly infested with lice, but, in the absence of the hypothetical causative organism, typhus did not, of course, ensue. Given its presence as in the wars of previous centuries, typhus would assuredly have resulted. The importance of these considerations in military hygiene, as indicating the imperative necessity of drastic treatment of lice, can hardly be over-estimated.

Synonyms of typhus indicating its prevalence in gaols are only less numerous than the military synonyms. Huxham, in 1742, termed it *febris contagiosa in carceribus genita;* Pringle, Heysham, and John Howard, *Jayl fever;* Sauvages, *Typhus carcerum;* Burserius, *febris carceraria;* J. G. Smyth, in 1795, *jail distemper ;* and many French writers, *maladie des prisons.* All these medical men were agreed that though dirt and destitution were inseparable from typhus, the essential cause was overcrowding, and they vaguely conceived the virus to be generated in the exhalations. This view has crystallized out in a forcible and expressive passage from William Grant's essay on the " Pestilential Fever," published in 1775. " If any person," he says, " will take the trouble to stand in the sun and look at his own shadow on a white-plastered wall, he will easily perceive that his whole body is a smoking dunghill, with a vapour exhaling from every part of it "; and the vapour from this human dunghill Grant conceived to be the efficient virus of typhus.

John Howard, describing, in 1784, the inexpressible filthiness of British prisons, says : " If it were asked what is the cause of gaol fever, it would in general be said, the want of fresh air and cleanliness. But as I have seen in some prisons abroad, cells and dungeons as offensive and dirty as any I have observed in this country, where, however, the distemper was unknown, I am obliged to look out for some *additional cause* for its production." He seems to incline to regard this factor as in some way bound up with overcrowding, but it did not occur to him that it was the presence of infected body-lice.

So frequently did typhus fever originate in the gaols, and spread from them to the population of towns, in which typhus had not been present previously, that medical men were driven to the seemingly not unreasonable conclusion that typhus could be generated *de novo* in dirty, overcrowded prisons. During the nineteenth century epidemics of

typhus were frequent in the overcrowded French prisons, and invariably arose within the gaols. In these instances the possibility of importation from without was almost non-existent, for typhus was practically absent from France. But there is no difficulty of understanding its origin, if we assume that there were typhus-infected lice or their ova in the prisons. It must be borne in mind that the same beds and the same prison clothing would be utilized by successive relays of prisoners.

In 1839 there was a severe outbreak of typhus in the gaol at Rheims. Some of the cells were grossly overcrowded, others were not. The fever commenced in and was confined to the overcrowded cells, except for two cases in a part of the gaol that was not overcrowded. There was no typhus in or about Rheims prior to the outbreak in the gaol. I would suggest that the difference between the overcrowded part and the rest of the gaol was *this*, that only in the former part was a temperature of atmosphere reached high enough to hatch out the infected ova of body-lice. That typhus is transferable from the louse to its ovum has been proved by experiment recently.

In 1854 an outbreak of typhus occurred in Strasbourg gaol during a period of overcrowding. There had been no typhus either in the gaol or in the town of Strasbourg since 1814. Adapting the louse theory of transmission to these facts, it is difficult to avoid the conclusion that infected ova had lain dormant for forty years, and become vivified and active under the influence of a suitable temperature. I have been unable to find any reliable evidence on the life-habits of the body-louse by which to test such an audacious hypothesis. The literature of the subject is abundant, but consists chiefly of casual untested statements transferred from book to book. A short report by Warburton to the Local Government Board is a noteworthy exception, but for all that the louse still awaits his biographer. To assume the presence of a typhus carrier—if such a condition were known to exist—would not lessen the difficulty, for he equally must have carried the virus for forty years, and that without previously communicating typhus.

The records of the six so-called Black Assizes, in some of which a disease that closely resembled typhus fever was communicated by the prisoners to many of those in court, including even judges and high sheriffs, are full of epidemiological interest. But before some of these are accepted as outbreaks of typhus fever the evidence requires much more careful sifting than it has received at present.

Typhus has derived several of its synonyms from its aforetime prevalence on ship-board. Huxham, in 1752, designated it *Febris*

pestilentialis nautica; Lind, in 1763, and Grant, in 1775, *Ship-fever;* Burserias, in 1785, *Febris nautica;* Blane, in 1789, *Infectious Ship-fever.* Outbreaks of typhus on ships were of constant occurrence in the eighteenth century, and the conditions under which they seemed to arise led the best medical opinion to the conclusion that the disease was generated *de novo* aboard ship in conditions of dirt and overcrowding. A few examples out of many given by Murchison and others will indicate sufficiently the grounds on which they came to this conclusion. James Lind recorded an outbreak on a frigate several weeks after it had left the coast of America. Thus there was no possibility of importation in the interval, and the period that elapsed before the outbreak was far too long for incubation of an infection received before landing. Again, in 1810, there was an outbreak among the French prisoners on the prison-ships in Plymouth harbour. There was no typhus in Plymouth, and if there had been the ships were completely isolated. Again, in 1829-30, there was an outbreak on the French convict hulks at Toulon, though there was no typhus in Toulon. The conditions were the same as prevailed at Plymouth. Five other epidemics—in 1820, 1833, 1845, 1855, 1856—occurred in these same convict hulks, always under conditions of overcrowding and uncleanliness. The difficulty in all these cases disappears, if we assume the presence aboard ship of infected lice or their ova. No theory of typhus carriage could well explain the six successive outbreaks at Toulon over a period of thirty-six years.

In 1861 an Egyptian frigate with a crew mostly composed of Arabs imported typhus into Liverpool, infecting the attendants at the public baths as well as twenty-five inmates of the Southern Hospital. Although unspeakable filth and overcrowding prevailed on board not one of the crew had typhus, either on the ship or in Liverpool, though they communicated it to many. We may draw at any rate this useful conclusion from the circumstances—viz., that even if we have established the transmissibility of typhus by lice, there still remain other problems of its epidemiology to be solved.

Occasional spontaneous outbreaks in hospitals served to provide a few other synonyms for typhus. Pringle, in 1752, pointed out that it did arise in hospitals in the absence of typhus from the locality, and termed it *Malignant fever of the hospital;* Burserius, in 1785, named it *Febris nosocomialis;* and several French writers, *Fièvre des hôpitaux.*

Importation into a hospital is difficult to disprove, and it is not without interest that in the case of a recent epidemic of typhus in North

West India, a careful examination of the bedding disclosed the presence of numerous ova of the body-louse.

A careful investigation of the relative geographical distribution of body-lice and of typhus, though open to various sources of fallacy, should help to determine the relationship of typhus and lice. So far as such evidence is available, it points strongly to a preference of typhus for countries in which body-lice are or have been most prevalent. This is a hard saying in view of the fact that the British Isles have been regarded generally as the favourite haunts of typhus.

The filth of the streets and watercourses of London in Tudor and Stuart times was notorious throughout Europe, and if we may credit the much-travelled Erasmus, their condition was matched by that of the interior of the houses. He ascribes the sweating sickness to " the filthiness of the streets and the sluttishness within doors." " The floors," says he, " are commonly of clay strewed with rushes, which are occasionally renewed, but underneath sometimes lies unmolested a twenty-years-collection of beer, grease, fragments of fish, spittle, the excrement of dogs and cats, and everything abominable."

Stuart literature, too—Pepys' " Diary " for example—gives one a lowly idea of the contemporary standard of personal cleanliness, and there is evidence that suggests that a change of habit in this respect was a Stuart importation from France. I am disposed to regard the intense cult of cleanliness in the average British-born person of to-day as evidence, by its very fervour, of a comparatively recent conversion. Far be it from me to hazard any suggestion as to the reason of the persistence of typhus in Ireland after it has disappeared from England. Perhaps, however, I may quote what Hirsch had to say in 1881. " It is always and everywhere," he says, " the wretched conditions of living, which spring from poverty and are fostered by ignorance, laziness, and helplessness, in which typhus takes root and finds nourishment ; and it is, above all, in the want of cleanliness, and in the overcrowding of dwellings that are ventilated badly or not at all, and are tainted with corrupt effluvia of every kind. The prototype of these conditions is found in Ireland, which is the greatest sufferer from the disease ; all observers agree that in them lies the true cause of typhus, unconquerable in, and inseparable from, the Irish proletariat, faithfully following the Irishman whenever he transplants himself and his misery."

In conclusion, let me adduce one piece of direct positive evidence from Murchison, all the more weighty because he had no conception of its import. He mentions two occasions only on which he himself

personally investigated the local conditions under which a sporadic case of typhus had seemingly arisen *de novo*. In one of the two he had the assistance of the medical officer of health of the district, and this is what they found: "The habits of the family were filthy in the extreme. The parish inspector found the rooms alive with vermin, and the nurses in the fever hospital declared that they had scarcely ever known patients admitted in such a filthy state."

DISCUSSION.

Dr. F. M. SANDWITH said he would like to express the pleasure it gave him to listen to Dr. Crawfurd's paper. There were many instances of more recent date, doubtless not unfamiliar to the author, of the confusion between plague and typhus. It used to be thought that plague was only the concentrated quintessence of typhus, and that the latter often preceded plague. There is the story of Dr. Clot Bey, who was well acquainted with plague in Egypt, and who, on seeing cases of typhus in a London fever hospital, with parotid buboes, said, "Yes, in Egypt we call those cases plague." Dr. Crawfurd was no doubt aware that at Benghazi (Tripoli) typhus and plague had been called by the same name, and the two diseases confused with each other of late years. With regard to war epidemics, he had only read about the Crimea, but in 1878 he saw hundreds of cases of typhus on the Turkish side, and there were said to be 100,000 cases on the Russian side. And, according to the newspapers, similar cases were said to be occurring now in Turkey. There was no doubt, as Dr. Crawfurd said, that in regard to overcrowding, which had been looked upon as the chief predisposing factor of typhus, and more or less of plague also, it was simply that overcrowding meant something favourable to the vermin which were the carriers of disease. It was obvious that if one had no fire in the house in winter, if the windows, which were very small, were stuffed up with clothing, and if one crowded on to the bed all the available blankets, and persons in the house slept as near together as possible, the vermin present stood a very good chance of getting fed. When Dr. Crawfurd referred to the flea season being in the summer months, no doubt he was referring entirely to Europe ; and he would like to remind the author that there was a definite flea season in some countries; that flea season, which in Cairo came to an end in June, explained the fact that plague had never been epidemic in any severity in Cairo after June 24, St. John's Day. When one went farther south there were no fleas, and therefore no plague, and, he believed, no typhus either. Apropos of that—in case any hearer might feel inclined to contradict him— the disease in the Sudan which killed off many people in the Mahdi's time was probably cerebrospinal meningitis, not typhus. As an old pupil of Murchison's, he was very much interested in reading while in Egypt his statement that typhus was unknown in Africa. What that author probably

had in his mind was Tropical Africa. He (Dr. Sandwith) found plenty of typhus in Egypt, not only in prisons, where there was also relapsing fever, but elsewhere. And it was a modern corroboration of Dr. Crawfurd's researches that when cleanliness was introduced into the prisons, and the prisoners were made to wash themselves and each other, the quantity of lice diminished, and typhus and relapsing fever came almost to an end ; not quite, however, for it occurred in successive outbreaks in the same prisons.

Dr. CRAWFURD, in reply, said that one day he met in the street an English medical man whose practice was in the Sudan along with an Egyptian medical man, and to them he put the question about typhus. The doctor who was practising in Cairo and thereabout said at once that he saw a great deal of typhus, while the practitioner in the Sudan thought he had never seen a case. So apparently the line of demarcation was drawn somewhere between the two. With regard to his paper as a whole, the purpose in reading it was to suggest that if it was possible, from the history of medicine, to substantiate the cause of one disease, it would probably be so in the case of others also. He might be pardoned for mentioning the personal point that it was from reading the history of medicine that he concluded that it must be lice which conveyed the disease ; it was only when he looked up the most recent pathology that he found the point had already been determined.

D—4

Notes on Early Portraits of John Banister, of William Harvey, and the Barber-Surgeons' Visceral Lecture in 1581.

By D'Arcy Power, F.R.C.S.

One morning shortly before Dr. Frank Payne left Wimpole Street to live at Barnet, I went in to look at his books, which he was always glad to show his friends, and he asked, "Have you ever been to the Hunterian Library at Glasgow?" I answered, "No, but everyone says it is well worthy a visit because William Hunter was a greater collector of rarities than his brother." Dr. Payne said, "I was there a little while ago and the librarian showed me a most interesting picture. I had it photographed, and thinking of you, I had an additional proof made which you will accept from me as a present. The picture represents John Banister, a surgeon. I know nothing about it, but it is so full of detail that it could only have been painted by a miniaturist. You like answering riddles, so that some day perhaps you will be able to tell us more about it, when we have started that Society for Medical History about which we have so often talked." I took the photograph home, had it framed, and in 1910, when I was editing some Treatises of John Arderne for the Early English Text Society, I had occasion to visit Glasgow to collate my proofs with the MSS. preserved in the Hunterian Library. Mr. Galbraith, the librarian, was extremely courteous, and showed me the picture (Plate I) which had excited Dr. Payne's attention. It is contained in a volume of Master John Banister's Anatomical Tables, in folio, bound late in the sixteenth century. The picture is double-page, mounted on guards and backed with modern white paper.

Dr. John Young's Catalogue of the Hunterian Museum Library (Catalogue of Manuscripts), describes it in the following words (p. 290) :—

"The double-page picture represents John Banister standing between a skeleton at which he points with a silver-mounted cane, and a corpse in course of dissection, on whose exposed viscera he rests his left hand. He wears a narrow-brimmed velvet bonnet, master's robe and white surgeon's sleeves, as do also his four assistants. He also wears a jewelled gold pendant suspended by a black silk ribbon round his neck. One of his assistants wears a somewhat similar jewel of blue enamel and pearls.

PLATE I.

John Banister (1533-1610) delivering the Visceral Lecture at the Barber-Surgeons' Hall, London, in 1581. (From a contemporary painting now in the Hunterian Library at Glasgow.)

D—12a

"Behind the lecturer on a desk lies a book open at pages 419, 420, with the following title : 'REAL. COL. CREM. DE VISCER. Lib. XI, above which in red : ' Anatomia scientiæ dux est | aditumque ad dei agnitio | nem præbet. | Iohannes Banister Aetatis | sui Anno 48 ·Anno Domini 1581.' A white-bearded doctor in furred robe and brimmed bonnet points his left forefinger at the head of the subject. One (left) of the two assistants in the foreground is passing an instrument to the other (right), while behind the two others (facing) are eight faces (of students ?).

Above these heads and immediately· under the date (given above) are two heraldic blazons. On the left, for arms, a shield (argent) bears a cross flory (sable), and a crescent (sable) in the dexter canton (difference) ; for crest, a peacock proper on a steel closed helmet with red and white mantling, and for motto, Tendit in ardua Virtus. On the right for arms, a shield divided quarterly by a St. George's cross (gules), surcharged with a lion passant regardant (or) bears 1 and 4 (sable) a chevron (argent) dividing three b's (argent), 2 and 3 a Tudor rose (gules) crowned (or) on a field party per pale (argent and vert) with chained boarhounds (?) (tenny) spotted (argent gules and vert) ; for supporters, for crest [an opinicus] (tenny), and for motto, De praescientia Dei." [1]

The picture represents John Banister delivering the " visceral lecture " in the Barber-Surgeons' Hall at Monkwell Street. The carefully painted figure in the Master's hat and the furred gown is probably the Master of the Company for the year 1581. If so, he is Robert Mudesley, to whom Thomas Vicary bequeathed " my best single gowne faced with black satten." He is also mentioned in the 1569 grant of arms as one of those governors of the Barber-Surgeons Company who petitioned for some permanent mark in their armorial bearings to commemorate the union of the Barbers and Surgeons. The grant by letters patent took the form of, " an augmentation in chief to their old and auncient arms with heaulme and crest to the same." It was

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[1] The arms of the Barber-Surgeons which are here described incorrectly are those granted to the United Company by Sir Gilbert Dethick, Garter King at Arms, in 1569. They are : '' Quarterly the first sables a cheveron betweene three Flewmes argent ; the seconde quarter per pale argent and vert on a spatter of the first, a double Rose gules and argent crowned golde ; the third quarter as the seconde and the fourth as the first. Over all on a Crosse gules a lyon passant gardant golde ; And to their Creaste upon the heaulme on a Torce argent and sables an Opinacus golde ; Mantelled gules doubled argent ; Supported with two Linxe in their proper coulor about their neckes a crowne with a chayne argent pendent therat." The motto " De praescientia Dei " first appeared in the armorial bearings of the Barber-Surgeons after this grant and it is still used by the Company of Barbers.

perhaps for this reason that the painter has introduced the new coat-of-arms into the picture, containing a lion of England and two crowned Tudor roses.

The two senior stewards of anatomy are distinguished by their badges. It was enacted in 1555 that there should be chosen every year two "for the Anathomye and other two also to be chosen for to be stewards; so that two always shall stande for ij yeres because they that doo not worke of the Anatomy the one yere being Stewards for the provysyon of victualls they shall worke the other yere following. And they that shalbe chosen shalbe alwayes for the first yere Stewards, because that they shall see the makynge of them the yere before that they may be the more practysed in the doynge the next yere the sayed Anathomye that after it maye appeare by the workmanship that they be the dooers. Yf the Master and governors do goo about to breake the same acte they shall lose for a fyne to the hall xls."

The class consists of the members of the Barber-Surgeons Company who were obliged to attend the lectures under penalty of a fine.

The picture is interesting from many points of view, and first historically. It represents almost with the accuracy of a photograph the method of conducting anatomical teaching in London at the end of the sixteenth century, and so far as I know it is the only representation of the lectures given at the Barber-Surgeons' Hall. It furnishes two additional facts about John Banister. It is clear that he was the Company's visceral lecturer in 1581 which was not previously known, and it fixes the date of his birth, because if he was aged 48 in this year, he must have been born in 1533, and not as has been generally stated in 1540. He was armigerous, and clearly belonged to one of the Surrey families of Banester, who bore for arms " Argent a cross flory sable and for crest a peacock sitting, taking in its beak a serpent twined round its neck all proper." The crescent—his sign of cadency —shows him to be the second son. The minute accuracy of the picture is shown by the vade mecum which is used as the text of the lecture, and it will be noticed that the skeleton is supported and crowned with the colours of the Barbers Company, and a wreath of the same surmounts the helmet in Banister's arms. The book on the reading desk is " Realdus Columbus," and from its size I thought it must be the folio edition printed at Venice in 1559. Reference showed, however, that the passage in this edition is on folios 227 and 228. The picture gives the pages 419 and 420. Looking about for another edition I found the 8vo published at Paris in 1572, and on turning to chapter 5 of

book xi, the latter part of the passage quoted occurs just as the painter saw it on pages 419 and 420. The minute detail is also shown in the drawing of the scissors, the different shapes of the dissecting knives, the double-headed retractor held by the steward of the anatomies, and by the Company's badges worn by the lecturer and stewards. Of the drawing from the artistic point of view I am unable to speak. The two main figures of John Banister and the Master of the Company seem to me to be careful studies from life; the stewards and the audience are less carefully drawn. The body seems to have been drawn from the actual subject, who has a shrunken right leg—perhaps the results of old infantile paralysis—for the right foot is in a valgus position. The lecture is given on the passage: " Intestina igitur a ventriculo exoriuntur; eademq'; pene substantia videntur; licet aliquantulum tenuiore. Situs eorum est ab inferiori ventriculi orificio ad anum usque; abdominisq'; majorem partem occupant. Veteres Anatomici intestina in sex partes distinxere, distinctisq'; singulas nominibus appellauere. Ego vero si post tot seculorum recepta vocabula noui aliquid in medium proferre fas esset, intestina duo esse dicerem, quorum alterum tenue est, crassum alterum. Sed ut aliorum vestigia sequamur; (neque enim temere a veterum placitis discedendum est), sex esse dicemus intestina, duodenum, inquam, jejunum, ileon, coecum, colon, rectumq'."

It is possible by the help of this picture to reconstruct the life of John Banister, and I do so in the following words: He was born in 1533, and was perhaps the second son of John Banester, whose name appears seventy-ninth in the list of the members of the Barbers Company for the year 1537, when Thomas Vicary was third in seniority of the freemen, or more probably of John Banester of Cobham, one of the Barons of the Exchequer. We learn nothing more about him until 1563, when he acted as surgeon to the forces sent under the Earl of Warwick to relieve Havre. Here he became acquainted with William Clowes, who speaks of him as " master Banester, my dear and loving friend." In 1572, he was admitted a member of the Barber-Surgeons Company, and there is a note in the records saying that " Mr. Bannester of Nottingham was sworn and admitted a brother of this mystery. Whereupon he hath granted to the House yearly twenty shillings so long as he liveth, and to be liberal and commodious to this house in what he may and will send yearly a buck or two and hath paid ten shillings and shall have his letter of licence." Clowes may have helped him to this favour, or his inherited influence in the Company may have assisted him. In 1573 the University of Oxford granted him

a licence to practise medicine. The record runs, "Banister John ; after seven years in med[icine] suppl[icates] for lic[ence] to prac[tise] med[icine] 30th June 1573." He thus acted both as physician and surgeon, a very unusual combination at this time when the surgeons were still servants to the physicians.

In 1581 the picture shows that he was lecturing at the Barber Surgeons' Hall. His predecessor, in 1577, was Thomas Hall, brother of John Hall, of Maidstone, who wrote "the Historiall Expostulation." In 1585 he served on board ship during the Earl of Leicester's expedition to the Low Countries, and in 1593-94, on February 15, he was licensed to practise medicine by the Royal College of Physicians in obedience to the following letter from Queen Elizabeth :—

"Elisabeth R.   "By the Queen.

"Trustie and wel beloved. We greet you well. Whereas we are credibly informed that our well beloved subject, John Banister, gent., hath of long time practised the art of Chirurgerie in sundry places of this our realme, and also in some service upon the seas, and for his honestie and skilfulness therein was heretofore entertained by our late cousens and counsellors the Earles of Warwick and Leycester; and understanding that in the exercise of his science he hath always jointlie used the art of Physick with Chirurgerie, and that with such discretion and profit, that there hath not been made any complaint against him, but on the other side divers reports that he hath doone very much good to many persons, and especially in and about our citie of London, where he desireth to end his old yeares in quietness, as I truste he shall do, unles he happen to be molested by any of your College, by reason of his said practice. In respect of the good report which we have had of his sufficiency and honestie, and for the speciall favour we beare to all men of skill, experience and good behaviour, we have thought good to require you forthwith, upon the receipt hereof, to take order in yo᷒ College that the said John Banister may be by you and the College licensed and tolerated to practise the science of Physick and Chirurgerie, without any yo᷒ interruption, molestation or suite so long as you shall not find any just and apparent cause to the contrary. Whereof we doubt not he will alwayes have an especial care.

"Given under o᷒ Signet at o᷒ mannor of Otelands, the xxviii. day of Julie, in the xxxv. yeare of our Reigne. [1593].

"J. Wood."

The minutes of February 15, 1593-94, continue : " Quibus lectis, visum est universo Collegarum coetui, ut respectu illarum literarum a suâ Majestate scriptarum tam gratiosè et favorabiliter, permitteretur praedictus Joannes Banister ad praxin ; eâ tamen adjectâ conditione, ut in omni graviori morbo, et pleno periculi, unum aliquem ex societate Collegii ut adjutorem sibi in illâ curatione accersat et adjungat."

To those who know the history of the time it must be evident that this letter to the College of Physicians· was a deliberate attempt to further the union of medicine and surgery which was the ideal of the later Tudor revival of surgery.   John Hall, Gale and Clowes had all written strongly in favour of it.   Banister alone was strong enough to be acceptable both to the physicians in London and at Oxford as well as to the surgeons.   He probably accepted without demur the condition attached to the London licence.   The presentation of patients in danger of death or maim to the Master and Wardens of the Barbers and Surgeons Guilds had been an immemorial custom.   It was a safeguard to the practitioner as well as to the patient so long as patients were thought to die of their doctor instead of in spite of him.

It is probable that from this time onwards Banister lived in London and in Silver Street.   He died in 1610 and was buried in the church of St. Olave's, Silver Street.   The church was destroyed by the Great Fire, but it contained the following epitaph in verse which bears a decided resemblance to the poetry published by his old friend Clowes :—

" Great men that ne'er did good in all their Dayes,
  But at the very Instant of their Death,
Find yet no mean Commenders of their Praise,
  Although it lasts no longer than a Breath.
Shall then good Men, though lesser in Degree,
  Finde none to give them Right or Equity ?
If one shall say the great Man's Life was such,
  So good, so full of Hospitality ;
When God doth know, he ne'ere did half so much,
  Though thus he must be graced with Flattery ;
Shall meane Men, who such Workes truly did,
  Be nothing spoken of?   Oh, God forbid !
Not then as equalling with any Great,
  My fatherly good Friend, John Banister,
No more but 'Truth of thee, let me repeate,
  A sonne's Love-Tears, thy Body to interre.
That such as knew thee, better farre than I,
  May say thy Vertues did not with thee dye.
Thy Skill and Practice, that it self commends,
  Some of the best have truly found the same :
Not partially employed to wealthy Friends,
  But even the poorest Wretch, the Sick and Lame

Felt of the best; some Difference there might be,
　The Rich pay'd somewhat, poore Men had it free.
Thy Care and Cash laid out, for common Good,
　In greater Measure than came in againe.
But that Heaven's Blessing, with thy Bounty stood,
　Hardly had stretched so many to sustain.
But it is true, the liberal Heart God loves,
　And from him still all Cause of Lacke removes.
Thy Weekly Charity given to the Poore,
　In Bread, beside, in Money from thy Purse :
Even in the hardest yeares dealt at the Doore,
· 　When some repined that every Day did worse;
Make poore Men say, our good Relief is gone,
　Let them goe to thy Find-faults and have none.
Poore maymed Souldiers, sore sick-hearted Men
　That under Miseries hard Crouch did bow
Were freely cured, methinkes they cry, Lord, when,
　Where shall we find our good Physician now?
I doubt not, but some others will as much :
　Yet (in these Dayes) we find not many such.
Sleep then, thou happy soule, in endlesse Rest,
　All good Men's Groanes, be poured on the Grave ;
Live thou in *Abraham's* Bosom with the Blest
　Where Faith and Workes due Recompence shall have.
My sight grows Dimme, sighing my Heart makes sore,
　Tears blot my Paper, I can write no more."

" Banister was famed for his kindness to the poor," says Dr. Norman Moore, " especially to old soldiers, and for his extensive professional reading." He published :—

(1) " A Needful, New and Necessary Treatise of Chirurgerie, briefly comprehending the General and Particular Cure of Ulcers." (London, 1575, 8vo.) The book is dedicated to Thomas Stanhope, Esq., high sheriff of Nottinghamshire. Its substance is extracted from various authors, ancient and modern, particularly Galen, Calmetius and Tagaultius. It is by no means devoid of learning and method, but contains no improvement of theory or practice which can be cited as the writer's own. Several recipes of topical medicines of his own invention are subjoined, but they possess no intrinsic merit.

(2) " The History of Man sucked from the Sap of the most approved Anatomists." Nine books. (London, 1578, folio.)

(3) " Compendious Chirurgery : gathered and translated especially out of Wecker." (London, 1585, 12mo.) This is not a mere translation, but at the end of each chapter annotations are added, in which the author's errors are frequently corrected, and his deficiencies supplied from other writers, or the translator's own experience, with considerable

learning and judgment. "Indeed, Wecker," says Mr. Aiken, from whom I quote, "was an author who greatly required such an annotator, being a servile copyist of the ancients without reflection or method. One of the most important corrections made by Banister is his declaration against the use of caustic applications in punctures, and stitching in incised wounds of the tendons which Wecker had recommended."

(4) "Antidotary Chirurgical, containing Variety of all Sorts of Medicine, &c." (London, 1589, 8vo.) This is dedicated to the Earl of Warwick. It is a large collection of chirurgical formulæ, gathered out of various authors, with the addition of several of his own and of contemporary English surgeons. Some of these last are of an elegant simplicity, and are in general less compound than those of foreign practitioners. Those of Balthrop are among the best. Banister acknowledges the generous help of his contemporaries, Balthrop, Clowes and Goodrus.

(5) A collected edition of his works was published after his death under the title, "The Workes of that famous Chyrurgian, Mr. John Banester," in six books. (London, 4to, 1633.)

Richard Banister, the oculist of Stamford, in Lincolnshire (died 1626), was a near kinsman, perhaps a nephew of John Banister.

Throughout the Middle Ages the surgeons of London were taught systematically and practically. The Barber-Surgeons Company from its formation in 1540 organized a regular staff for the purpose, consisting of a Lecturer, who was sometimes a member of the Company, but was more often a young physician fresh from Oxford or Cambridge, of four assistants, sometimes called " Masters " and sometimes " Stewards " of the Anatomies, and an audience consisting of the members of the Company. The subjects were obtained from the place of execution, and were four malefactors yearly. The lectures were three in number, the " osteological," the " visceral " and the " muscular," and great care was taken that they should be conducted decently in order. They were public or at least so public that any person could attend upon the introduction of a member of the Company, and they ended with a dinner, which was one of the most important annual functions of the corporation. The following extracts will give some idea of the conduct of the business: " The body having been brought to the Hall," it is ordered in 1567 that, " there shal be pyllars and rods of iron made to

beare and drawe Courtaynes upon and aboute the frame where within the Anathomy doth lye, and is wrought upon, for bycause that no person or persons shall beholde the dissections of the body, but that all may be made cleane and covered with fayer clothes untyll the doctor shall come and take his place to read and declare upon the parts desected. And also yet fordermore that there shal be a case of weynscot made with paynter's worke upon it, as seemly as may be done ffor the skelleton to stand in."

Care was taken not only in choosing the lecturer, but his material comfort was provided for. It was enacted in 1555 that the stewards "which be appointed for the Anathomye for the year next following must sarve the Doctor and be about the body. They should see and provide that there be every yere a matte about the harthe in the hall that Mr. Doctor [be] made not to take colde upon his feete, nor other gentlemen that doo come and marke the Anatomye to learne knowledge. And further, that there be ij fyne white rodds appointed for the Doctor to touche the bodye when it shall please him, and a waxe candell to loke into the bodye, and that there shall be alwayes for the Doctor two aprons to be from the shoulder downwarde; and two payre of Sleaves for his hole Arme with tapes for chaunge for the sayed Doctor, and not occupye one Aprone and one payr of Sleaves every day, which ys unseemly. And the Masters of the Anathomye that be about the bodye to have lyke aprones and sleaves every daye both white and cleane, yf that the Masters of the Anathomye that be about the Doctor do not see these thinges ordered and that their knyfes, probes and other instruments be fayer and cleane accordingly with Aprones and Sleves, if they doo lacke any of the said things afore rehersed he shall forfayte for a fyne to the hall xls." It is to be remembered, too, that if fines were not paid, the Company had the power of summary committal to the Compter or even to Newgate.

The attendance at the lectures was compulsory. The ordinance of 1572 enacts that "every man of the company usinge the mystery or faculte of surgery, be he freman, fforeyne, or alian straunger shall come unto the Anathomye, being by the Beadle warned thereunto. And for not keepinge their houre both in the forenoone and also in the afternoone, and being a freman shall forfayt and paye at euery tyme iiijd. The fforeyn in like manner and the Straunger euerye tyme vjd. The said fynes and forfaytes to be employed unto the Anathomysts for the tyme beynge, towards theire charges within the tyme of the sayd Anathomye. And also for not comyng in all the tyme of the

Anathomye (having lawful occasion of absence) the Freeman shall pay vjd., the fforreygne viijd., and the Straunger xijd. And to be employed in manner and fourme aforesaid. And also iijs and iiijd. to the Masters and Gouernoures of the said Mystery for their summons brakinge notwithstanding. Provided also that they come well and decently appareyled for their own honestye, and also for the worshippe of the companye."

The following. directions, which were evidently given by an old clerk of the Company to his successor, new to the office, show how the business of a lecture was conducted. It is headed : "Form of the business at the time of a Public Demonstration of Anatomy."

"So soon as the body is brought in deliver out your ticketts, which must first be filled up as followeth — 4 sorts : The first fforme to the Surgeons who have served the office of Master you must say, Be pleased to attend, &c., with which' summons you send another for the demonstrations; to those below the Chaire you say, Our Masters desire your Company in your gown and Flatt Cap, &c., with the like notice for the Demonstrations as you send the Antient Master Surgeons. To the Barbers, if Ancient Masters, you say, Be pleased to attend in your Gound only; and if belowe the Chaire then, Our Masters desire, etc., as to the others above without the Tickett for the Demonstrations.

"The body being by the Masters of Anatomy prepared for the lecture (the Beadles having first given the Doctor notice who is to read, and taken orders from the Master or Upper Warden of the Surgeons' side concerning the same), you meet the whole Court of Assistance in the Hall Parlour, where every gentleman clothes himself, and then you proceed in form to the Theatre (vizt), the Beadles going first, next the Clerk, then the Doctor, after him the severall gentlemen of the Court. And having come therein, the Doctor and the rest of the Company being seated, the Clerk walks up to the Doctor and presents him with a wand and retires without the body of the Court until the lecture is over, when he then goes to the Doctor and takes the wand from him with directions when to give notice for the reading in the afternoon, which is usually at five precisely, and at One of the clock at noon, which he pronounces with a distinct and laudable voice by saying : ' This Lecture, Gentlemen, will be continued at Five of the clock precisely ' : having so said, he walks out before the Doctor, the rest of the Company following down [to] the Hall Parlour, where they all dine, the Doctor pulling off his own robes and putting on the Clerk's gownd first—which has been usuall for him to dine in—and after being plentifully regaled, they proceed as before

untill the end of the third day, which being over (the Clerk having first given notice in the fforenoon that the lecture will be continued at Five of the clock precisely, at which time the same will be ended), he attends the Doctour in the Cloathing Room, where he presents him, folded up in a piece of paper, the sum of 10 li.;0;0, and where afterwards he waites on the Masters of Anatomy and presents each of them in like manner with the sum of 3 li.;0;0, which concludes the duty of the Clerk on this account.

" N.B.—The Demonstrator, by order of the Court of Assistants, is allowed to read to his pupills after the Publick Lecture is over for three days and untill Six of the clock on each day, and no longer, after which the remains of the body is decently interred at the expense of the Masters of Anatomy, which usually amounts unto the sum of 3;7;5."

The second picture (Plate II, p. 31) I wish to show you is this oil painting on a panel of Dr. William Harvey, and you will see at once that it is in many respects similar to that of John Banister. I bought it in London in July, 1912. It is a three-quarter length of Harvey, who is represented standing in his study with his left hand resting upon a table, whereon is spread a diagram of the arterial system. The face is a more pleasing likeness than many of his other portraits, and shows him with long grey hair and a skull-cap. He is clothed in a long-sleeved, damascened waistcoat, confined at the waist by a belt, with a collar and wristbands of point lace beautifully painted. Over all he wears a long gown heavily trimmed with fur. The thighs and legs are not shown. The background is a green curtain partially drawn aside to show the shelves of the study, and on the curtain is a description in red letters :—

<div align="center">

Gulielmus Harveus, M.D.

Aet. sue 61

1639

</div>

The accessories are interesting. On the table a watch keeps down the edge of the diagram to prevent it folding up. There is an inkstand with a quill-pen in it, and a terrestrial globe. Immediately behind the table is a shelf on which is a simple microscope, with a coarse and fine adjustment on the principle of the modern automatic letter-weighing machine ; a retort partly filled with fluid, a pair of scissors, a dissecting knife, and a sheet of paper. The bookcase consists of six wooden

shelves divided by a median partition, mere rough shelves. The lowermost shelf has a urine glass and a minim measure lying at the extreme edge. In the partition nearest Harvey are two flasks, one containing a green the other a red fluid ; a wide-mouthed jar covered with parchment, the jar is earthenware and behind it are two square bottles like case bottles. A quire of loose paper leans against it. On the other side of the partition of this lower shelf are two bottles, one unstoppered the other stoppered, filled respectively with a red and green fluid. There is also an object like a catherine-wheel which I do not recognize. The second shelf from the bottom contains thirteen dumpy duodecimo volumes, bound uniformly in parchment, whilst upon the other side are three quarto volumes well bound in morocco and piled one above the other. The third shelf from the bottom is filled with books, four of which are smaller than the rest. The fourth shelf is wholly filled with books with the exception of a space showing where one has been removed. The fifth shelf contains books of various sizes. On the top shelf are two skulls, a square case upon which stands a stoppered phial filled with some red substance, and four earthenware jars, whose mouths are closed with parchment covers tied on.

The whole scheme of the picture is carried out in dark green and red, the effect being pleasing and subdued.

The portrait of Harvey is a faithful representation of the great physician as the painter saw him, just as I have very little doubt that the picture of John Banister is a good likeness. Both are sober representations painted by men who reproduced with photographic accuracy what they saw. No attempt is made to introduce any artistic element, and detail takes the place of idealization. In the picture of Banister the badges and the rings on the lecturer's finger are painted with great care, and I am not certain that what seems at first sight to be a second ring on the left fourth interphalangeal joint is not in reality a piece of rag tied on with a thread. The arms of the Lecturer and of the Barber-Surgeons Company are depicted with the accuracy of an heraldic artist, and the Barbers' colours are painted on the supports of the skeleton, just as we know was really the case. In like manner in Harvey's picture, the painter has lavished a great deal of work on the fur of the robe, on the damascene of the waistcoat, and on the point lace. It is a little remarkable that, although there is plenty of room on the curtain for a coat-of-arms, none is represented. It may mean that Harvey was not armigerous.

Dr. William A. Shaw contributed an interesting paper to the

PLATE II.

William Harvey, M.D. (1578-1657), at the age of 61.
(From a contemporary painting in the possession of Mr. D'Arcy Power.)

Connoisseur for October, 1911,[1] upon "An Early English Pre-Holbein School of Portraiture," for a knowledge of which I am indebted to Mr. F. G. Thomson. Dr. Shaw thinks that an indigenous school of portraiture flourished in England between the reigns of Henry VI and Elizabeth. From first to last it was entirely native, indigenous and national. It took nothing from and owed nothing to foreign influence. In its forms, its technique, its characteristics or inspiration, and its limitations it was English, and merely English from its dawn to its close. "The outstanding and distinguishing features of this art," says Dr. W. A. Shaw, "were :—

"(1) *Technical.*—(a) The consistent employment of an oil medium from a time long antecedent to the use of an oil medium on the Continent. (b) Profuse and most skilful application of gold, both for details and ornamentation rather than for backgrounds. (c) An absolutely unequalled skill in the painting of jewels, precious stones, details of ornament and fur. (d) Profundity and richness and transparency of colour equal to anything that Flemish or Italian art can show. (e) A general preference for a level green background, much quieter and more neutral than the terre verte backgrounds of the French or the German schools. (f) The background is never decorated or floriated, and the device of a landscape was only in vogue for a short period about the reign of Edward VI., and was never assimilated by the native English artists. (g) A decided preference in the earlier stages for the stiff and infantile device of arranging the figures square behind a parapet. (h) In the vast majority of cases the employment of panel rather than canvas, and the panels prevailingly small.

"(2) *Spiritual.*—In its essence the art reflects the inherent abiding qualities of the English race itself. It is perfectly sincere, truthful, unassuming, jolly, blithe and debonair, but matter of fact, business-like, and completely devoid of romanticism, and of imaginative artistic warmth except in the colour sense. From first to last the power of idealization and characterization is absent. The figures are so completely detached from the backgrounds that they appear almost as if done separately, and then stuck down upon it as a photographer might mount a photographic print. In the face work the naturalness of portrayal is accomplished by a freshness of flesh colouring, and by a subtle power of moulding which will challenge comparison with the work of any school."

[1] *Connoisseur*, 1911, xxxi, pp. 72-81.

Dr. Shaw believes that the painters of this school were the King's serjeant-painters, who were usually skilled artists. Nicholas Hilliard (1537-1619), who was serjeant-painter to Elizabeth, was noted as the first English painter of miniatures. His drawings were executed with much care and fidelity, and with great accuracy of detail in costume, but the faces are pale and shadowless. His work was excelled by his pupil, Isaac Oliver or Olivier (1556-1617), who also paid especial attention to the details of costume, armour, jewels and other accessories in his paintings. These are exactly the points shown by the picture of John Banister. It is minutely accurate in detail, and, as Dr. Payne originally remarked, it must have been painted by a miniaturist. The main portraits stand out pre-eminent, but very little skill is shown in the general grouping, and I think it is plain that the painter had in his mind Holbein's picture commemorating the union of the Surgeons Guild with the Barbers Company, which is still one of the treasured possessions of the Barbers Company at Monkwell Street. I think, therefore, that the picture was certainly painted by a member of Hilliard's school, perhaps by one of the pupils, but most likely by the serjeant-painter himself.

Turning now to the portrait of Harvey, it is interesting to notice its date. It was painted after April 1, 1639, the year in which Harvey was appointed Senior Physician in Ordinary to the King. Dr. Bethune died in July, 1639, and the Letter Book of the Lord Steward's Office contains the following order about his successor :—

"CHARLES R.

"Whereas we have been graciously pleased to admit Dr. Harvey into the place of Physician in Ordinary to our Royal Person, our will and pleasure is that you give order for the settling of a diet of three dishes of meat a meal, with all incidents thereunto belonging, upon him the said Doctor Harvey, and the same to begin from the seventeenth day of July last past and to continue during the time that the said Doctor Harvey shall hold and enjoy the said place of Physician in Ordinary to our Royal Person for which this shall be your warrant.

"Given at our Court of Whitehall the sixth of December 1639.

"To our trusty and well-beloved Councillors Sir Henry Vane and Sir Thomas Jermyn, Knights, Treasurer and Comptroller of our Household or to either of them."

The appointment in addition to this " bouge of Court " carried with it a lodging at Whitehall and a pension or annual payment of £400 a year.

In August, 1642, shortly after the King had left London to raise his standard at Nottingham, a mob broke into Harvey's lodgings at Whitehall, stole his goods, and scattered his papers. These papers consisted of the records of a large number of post-mortem examinations with his observations on the development of insects and a series of notes on comparative anatomy. Harvey bitterly regretted the loss, and laments it in the following words: " Let gentle minds forgive me if, recalling the irreparable injuries I have suffered, I here give vent to a sigh. This is the cause of my sorrow :—Whilst in attendance on His Majesty the King during our late trouble, and more than civil wars, not only with the permission but by the command of the Parliament, certain rapacious hands not only stripped my house of all its furniture, but, what is a subject of far greater regret to me, my enemies abstracted from my museum the fruits of many years of toil. Whence it has come to pass that many observations, particularly on the generation of insects, have perished with detriment, I venture to say, to the republic of letters."

A consideration of this picture shows, I think, that it belongs to the same school as that of Banister—the school of the Court Painter. There is a similar absence of imagination ; a similar prominence and sober painting of the subject; the same minute fidelity in the details of the background. Everything points to the fact that the painter was unaccustomed to idealize, and was more conversant with actual facts. It is the same difference that we notice in the Tower Bridge and in Waterloo Bridge—the one is mechanical and useful, the other is graceful as well as solid and convenient. It was the business of the King's Serjeant-Painter to overlook the painting of carriages, heraldic drawings, &c., but he was also an artist, and there is very little doubt that he often added to his income by painting clients. From the pictures left to us, it seems as if these clients had their portraits painted when they succeeded to Court appointments, or had gained some prominent position. We know, for instance, that Dr. Linacre, Dr. Butts, Dr. Caius, Nicholas Alsop the King's Barber, and others, were painted in this manner. I have shown you the portrait of John Banister, and I believe that this portrait of Dr. William Harvey was painted in like manner by the King's Serjeant-Painter —one of the De Critz's — immediately after his promotion to the

office of Senior Physician in Ordinary to Charles I. If this was the case, the little books on the shelves in the background may be those very papers which were destroyed by the mob three years afterwards, the room itself being the cabinet or study in the newly allotted rooms at Whitehall.

DISCUSSION.

The PRESIDENT (Sir W. Osler, Bt., F.R.S.) asked whether Mr. Power had compared the picture of Harvey with other portraits with reference to his appearance in 1639. It was of interest, as there were many portraits of Harvey extant, some of which were not originals. In this picture he looked an older man than in any other except the one in the National Gallery. A supposed portrait of Harvey by Jansen, dated 1656, had been for sale for some years. It represents a middle-aged man resembling Harvey, but at that date he was an old man. The pedigree of the picture, as given to him, was interesting, in that it came from Colonel Harvey Branscombe, a collateral descendant of Harvey. But Colonel Harvey Branscombe wrote that he had never owned such a picture : if he had he certainly would not have parted with it under any circumstances. He (Sir William) could never get any satisfaction from the dealers as to the manufacture of that spurious pedigree. The picture was at present in Boston, Mass., and was still offered as a genuine Harvey.

Dr. H. A. CLOWES remarked that William Clowes, the son of Banister's friend, was serjeant-surgeon to Charles I, and died in the year 1648. He (the speaker) possessed a copy of his will, made in 1639. Harvey and he sat upon a Commission together to inquire into charges of witchcraft. There appeared a poem at the end of one William Clowes's books which ran :—

> " Deserving more than laurel bowes
> Is the worthy work of William Clowes."

This suggested that the name was not pronounced " Clews " at that time.

Dr. MICHAEL FOSTER sent for exhibition two Italian diplomas. The first was granted to Augustin Rossi as a Doctor of the Canon and Civil Law. It is dated from Padua in the year 1714, and has the seal intact, and attached by the original cords. The second is a licence to practise surgery granted to Laurentius Maria Saura, and dated Venice, 1755.

Mr. D'ARCY POWER showed at the same time the facsimile reproduction of William Harvey's diploma of 1602 to prove how little change the form and language of the diplomas had undergone in the course of a hundred years in the Italian universities.

Section of the History of Medicine.

January 29, 1913.

Sir Wm. Osler, Bt., F.R.S., President of the Section, in the Chair.

————

Plague Banners.

By Raymond Crawfurd, M.D.

The custom of carrying sacred pictures in penitential processions, in times of pestilence, is one of some antiquity. If we may trust the tradition of the Church, which Jacobus de Voragine, Archbishop of Genoa, embodied in his Legenda Aurea at the end of the thirteenth century, it is at least as old as the time of Gregory the Great. Writing of that fierce outbreak of bubonic plague in Rome in 590 A.D., in which the pandemic of fifty years' duration discharged all its expiring virulence, the Archbishop says : " And because the mortality ceased not, he ordained a procession, in which he did do bear an image of our Lady, which, as is said, S. Luke the Evangelist made, which was a good painter, he had carved and painted it after the likeness of the glorious Virgin Mary. And anon the mortality ceased, and the air became pure and clear, and about the image was heard a voice of angels that sung this anthem :—

> " Regina coeli laetare : alleluia :
> Quia quem meruisti portare : alleluia :
> Resurrexit sicut dixit : alleluia : "

and S. Gregory put thereto :—

> " Ora pro nobis, Deum rogamus : alleluia."

At the same time S. Gregory saw an angel upon a castle, which made clean a sword all bloody, and put it into the sheath, and thereby S. Gregory understood that the pestilence of this mortality was passed, and after that it was called the Castle Angel (Castel S. Angelo)." The

F—10

contemporary account of this famous procession by Gregory of Tours mentions neither picture nor vision, but we have other evidence of the carriage of sacred pictures at this time. Some of you may remember, among the many gems in which Bede's Ecclesiastical History abounds, that picture of the arrival of Augustine and his companions in Thanet " bearing a silver cross for their banner, and the image of our Lord and Saviour painted on a board." Those of you who know and love Kent may set the picture as you please, perhaps in some sheltered dip of the downs, as they sweep landward from the sea, perhaps beside some quiet steading, where orchards and smiling cornlands teem with the abundance of the coming harvest.

The Byzantine historian Theophylactus also describes two occasions, in 586 and 588 A.D., respectively, in which a sacred effigy of Christ, believed not to have been made by human hands, was carried into battle for the sake of inspiring valour and discipline into the soldiery.

The sixteenth century chronicler Baronius says that the picture which Gregory carried in this plague procession of 590 A.D. was that of the Madonna, now preserved in the Church of S. Maria Maggiore on the Esquiline, and still believed to protect Rome from plague and pestilence. Rome has no fewer than four pictures of the Madonna attributed like this one to the hand of Luke the Physician, and all of them reputed to have wonder-working powers. Expert opinion, alas ! pronounces the oldest of them a fifteenth century production. Miraculous Madonnas abound in Italy, but are, as a rule, of little artistic interest. Florence has her Black Virgin in the small village of Impruneta. This dark panel, blackened and perished with the lapse of years, was found, so goes the legend, in the soil at Impruneta, and uttered a cry as the workman's spade struck it. Seldom or never exposed to the gaze of the devout, she has suffered the indignity of an exposure at the hands of the omnipresent photographer. In the great plague of 1527 the Commonwealth of Florence determined to have recourse to the Black Virgin of Impruneta, whom they had so often invoked with success in various crises of their history. So the Black Virgin was brought over the hills from Impruneta, and the magistrates of Florence, says Segni, " barefooted, and in mourning, received her at the gate of the city and carried her in solemn and very sad procession to the Church of the Servites. Forty thousand citizens had died in the month of November. But the never-failing Virgin of Impruneta prevailed on this occasion also, for with the coming of the cold weather the sickness began to abate." The Black Virgin still watches over Florence in time of drought. Readers of " Romola "

will recall that other stirring procession of the Impruneta Virgin to the Duomo of Florence, in which Savonarola strode along defiantly among his company of black and white Dominicans. It was through these selfsame streets of Florence, at the latter end of the thirteenth century, that the populace carried aloft Cimabue's Madonna to the Church of S. Maria Novella, where it hangs to-day, in very joy that Art had awakened from her sleep of many centuries.

Still one more record of the carriage of pictures in these earlier years in time of plague. The scene is Constance, in 1414 A.D., during that council of prelates that condemned Huss to the stake. Plague had broken out fiercely, and they were about to disperse and fly from danger, when a young monk told them of the power of S. Roch. On his advice the council ordered an effigy of S. Roch to be carried in procession through the streets with prayers and litanies; and immediately the plague ceased. It was from this occasion that the cult of S. Roch, as protector against plague, became general in Central Europe.

In the Church of S. Pietro, in Vincoli at Rome, is a time-worn fresco, attributed to Pollajuolo (1429-98), which depicts in its essential features the description which Paul the Deacon has left of an outbreak of plague at Pavia. Paul says: "Many saw with their own eyes a good and a bad angel passing through the city by night. And whenever at the bidding of the good angel the bad one, who seemed to carry a lance in his hand, struck so many times with his lance on the door of each house, the same number of that household would die on the following day. Then it was revealed to someone that the plague would not cease until an altar was set up to Sebastian, Saint and Martyr, at the Church of S. Pietro in Vincoli. This was done, and as soon as the altar was set up the relics of the martyr saint were brought from Rome, and forthwith the plague ceased." This fancy of two conflicting demons originated in the religion of the Magians, was adopted from them by Mahomet, and passed from Arabia to Europe. Pollajuolo has transferred the scene that Paul described from Pavia to Rome, and added certain details of his own. In the background, at the summit of a flight of stairs, seemingly suggested by those of Ara Coeli, which were set up as a memorial of the Black Death, a citizen is telling to Pope Agatho, who is seated among his cardinals, his dream that the pestilence will not cease till the body of S. Sebastian is brought into the city (fig. 1). On the right the good angel indicates the condemned houses to the bad angel in the guise of the Evil One, who strikes on the door with his lance. On the left a procession is bringing in the relics,

carrying a banner, on which the Madonna is depicted with robes spread out in protecting attitude. The foreground is strewn with bodies of the dead. In the sky the angel that spreads the pestilence hovers, bow in hand, discharging the arrows of pestilence.

This fancy of the protecting Madonna, spreading her robes over her suppliants, as a hen gathers her chickens under her wings, is borrowed from Hebrew poetry. It figures in a similar conception in the language of the ninety-first Psalm: " I will say unto the Lord, Thou art my hope and my stronghold: my God, in Him will I trust. For he shall deliver thee from the snare of the hunter, and from the noisome pestilence. He shall defend thee under his wings, and thou shalt be safe under his feathers." This plague of 680 A.D. depicted by Pollajuolo is a landmark in the history of plague, because it led to the veneration of S. Sebastian as a protector from all pestilence, as that of 1414 enthroned S. Roch as the patron saint of the plague-stricken.

These scattered allusions afford some information as to the genesis of the plague banners, or *gonfaloni* of Perugia. They serve at any rate to show a lineage far older than the epoch of the Perugian School of Painting, and one that extends also beyond the boundaries of Umbria. It is only in a limited sense that they can be regarded as exclusive products of the Umbrian School, and particularly of its Perugian branch. Indeed, we shall see that the two most famous had actually a Tuscan *provenance*. It so happened that the most fertile period of Perugian painting, in the latter half of the fifteenth century, coincided with the devastation of Perugia by a succession of epidemics of plague; and at each fresh outburst the painters of Perugia were called upon to produce these tributes of popular devotion. Before these suppliant banners marched the priesthood in their robes, behind them followed a penitent people, striking their breasts and wailing aloud " Misericordia." The remedy was well adapted to their sufferings, for these processions of penitents traversing the city and following banners that displayed the figure of the Redeemer, or the Madonna, or some plague saint, produced in their souls such a degree of spiritual exaltation as made despondency impossible. Men gazed on them as they gazed on the Brazen Serpent that Moses set up in the wilderness to stay the pestilence. A striking banner is that by Bonfigli, in the Church of S. Fiorenzo at Perugia, painted in 1476, during an epidemic of plague. Above kneels the Madonna; before her stands the Child in a basket of roses supported by angels, who are wearing chaplets of roses, as in most of Bonfigli's pictures. Both Madonna and Child are crowned. Below kneel groups of citizens, men

FIG. 1.

[*Anderson, Rome.*

and women, with Sebastian and other saints, supplicating the Madonna. An angel upholds a scroll on which is inscribed a fervid call to repentance, blended with fierce denunciation of their sins. This jeremiad in verse was composed by Lorenzo Spiriti, and runs :—

> " O popolo ostinato, iniquo e rio
> Crudel, superbo, ingrato e pien d' inganno, &c.,"

which has been anglicized, as follows, by Lina Duff-Gordon, in her " Story of Perugia ": " Oh, most obstinate and wicked people—cruel, proud, and full of all iniquity, who have placed your faith and your desires on things which are full of a mortal misery, I, the angel of Heaven, am sent unto you from God to tell you that He will put an end to all your wounds and weeping, your ruin and your curse, through the mediation of Mary . . . Turn, turn, your eyes, most miserable mortals, to the great examples of the past and present, to the utter miseries and heavy evils, which Heaven sends to you, because of all your sins, your homicide and your adultery, your avarice and luxury. . . Oh miserable beings, the justice of Heaven works not in a hurry, but it punishes always, even as men deserve. . . Nineveh was a city florid and magnificent, and Babylon was likewise, but now they are nothing : and Sodom and Gomorrah, behold them now—a morass of sulphur and of fetid waters. . . Oh, therefore, be grateful and acknowledge the benefits and graces of our Saviour, and let your souls burn hotly with the fire of faith and charity, of hope and faithful love. . . But and if you should again grow slothful and unwilling to renounce your errors, I foretell a second judgment upon you, as I reckon that it will prove more terrible, more cruel than the first." In banners such as this, the imagination of the painter finds play for the crowding emotions not of his own heart only, but of the hearts of his fellow-citizens as well.

Another type of plague banner is Bonfigli's Madonna della Misericordia in the Church of S. Francisco del Prato at Perugia (fig. 2). It bears the date 1464. In the centre stands erect the majestic figure of the crowned Madonna. On her garment lie broken the arrows of pestilence, while beneath its ample folds kneel groups of monks and nuns in attitudes of prayer. Above, Christ, wearing both crown and cruciferous nimbus, casts arrows down. At His left hand is the angel of justice with sword drawn, at His right the angel of mercy with sheathed sword. Gathered around the Madonna and craving her intercession are S. Lorenzo and the Bishops SS. Severo, Costanzo, and Ludovico. Beneath these, to the right, SS. Francisco and Bernardino, and to the left S. Pietro (the

(Ed.^{ne} Alinari)
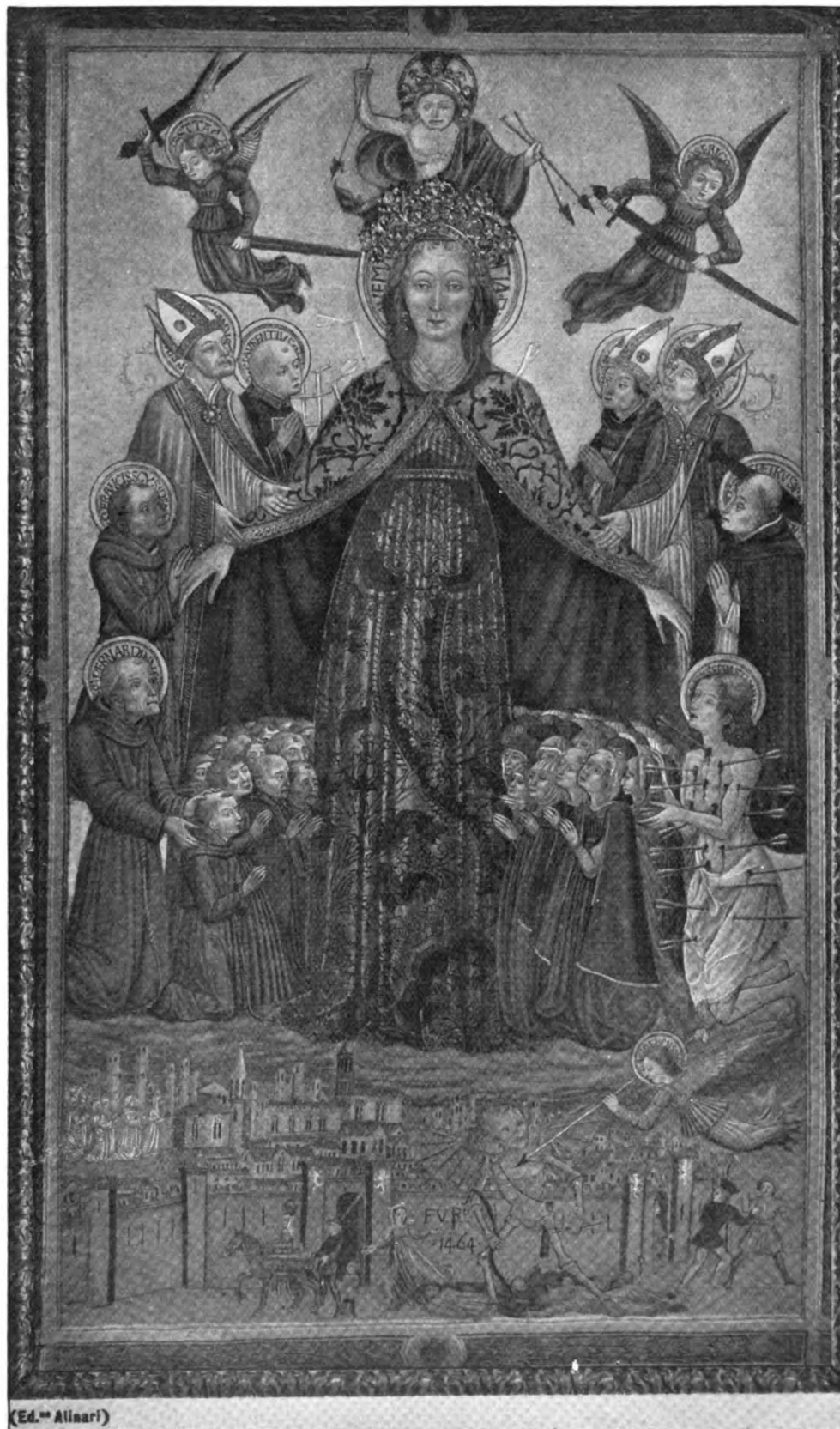
FIG. 2.

Martyr) and S. Sebastiano, whose body is pierced with many arrows. These saints have Perugia in their special keeping. At the foot of the picture is the city of Perugia with its emblematic griffin on the wall. Within the walls a white-robed confraternity is kneeling in prayer. Outside lurks Death, a bat's-winged skeleton with bow and arrows, whose victims strew the ground. But the prayers have prevailed, and already the Archangel Raphael strikes Death with his spear. In the foreground outside the walls is a fugitive family, the mother mounted on a donkey carrying her infants in its panniers. At the side gate two soldiers make off in haste, as the porter tells them the state of the city. Perugians say that not Bonfigli, but an angel, painted the face of the Madonna. They might well have said it of the exquisite Madonna del Soccorso in Sinibaldo Ibi's plague banner of 1482, in the Church of S. Francisco at Montone.

One more Madonna banner calls for passing notice—that of Bonfigli at Corciano, near Perugia, dated 1472. It has the same general character as his Madonna della Misericordia. The quaint head-gear of the angels supporting her robe is the rose-wreath, symbolic of the Madonna, which appears, in one form or another, in so many of her pictures.

We pass now to a second type of plague banner, in which the figure of the Redeemer replaces that of the Madonna as the central theme. Such is Bonfigli's banner in the Church of S. Maria Nuova at Perugia (fig. 3). The figure of Christ, wearing a cruciferous nimbus, dominates the picture. He holds the arrows of pestilence ready to be launched among the people. His face is sad and regretful as he executes faithfully the behests of His Father. On either side of Him saints bear the emblems of the Passion, and to the right and left are the darkened sun and moon. Beside Him kneel the Madonna and the Franciscan S. Paulinus. In the lowest part of the picture are the chimneys and towers of Perugia, with the pest-fiend, in the semblance of a huge bat, bearing a scythe, and the angel of deliverance smiting him with his lance. Below, shepherded by S. Benedict and S. Scholastica, the diminutive citizens kneel in prayer. In nearly all these banners, as in other archaic works, the dwindling size of individual figures indicates the lesser parts they have to play.

The third type of plague banner is that in which the figure of a saint plays the leading rôle. The saint is always S. Sebastian, only because in Umbria and Tuscany he was the chief accredited protector against pestilence. The finest example of this type is the peerless masterpiece

Fig. 3.

of Sodoma, now in the Uffizzi Gallery at Florence, one of the most beautiful creations of Renaissance art (fig. 4). It was painted in 1528 at Siena, for the Sienese Compagnia di S. Sebastiano in Camollia, and was carried in procession, whenever Siena was afflicted with pestilence. It was kept in the church of this confraternity at Siena, until it was removed to Florence in 1786. The undraped body of the saint is modelled on the lines of the youthful Apollo. He is bound to a tree in the foreground of a wild Italian landscape. His neck, side, and one thigh are transfixed with arrows. The upturned face wears an expression of ecstasy, in spite of suffering, as an angel descends to place the crown of martyrdom on his brow. The sublime pathos of the picture, inexpressible in words, unanalysable, haunts sense with a deep, abiding fascination. On the reverse of this banner is the Madonna with the Child in her arms, enthroned on clouds, above a kneeling group of SS. Roch and Sigismund and members of the Compagnia di S. Sebastiano, wearing the garments of their brotherhood. The work is much inferior to that of the face of the banner, and is said to be in part the work of Beccafumi (1486-1551). Brotherhoods such as this existed in most of the leading towns of Italy —that of the Misericordia in Florence, and of S. Rocco in Venice, for example—who devoted themselves gratuitously to the service of the sick and the carriage of the dead to burial. They may still be seen daily in the streets of Florence in the same long black cloaks as of old, and the same peaked hoods enveloping all the face but the eyes ; content in the dignity of the work done, and careless of the identity of the worker.

Though martyred in 288 A.D., it was not till the plague of 680 that the cult of Sebastian, as protector from pestilence, became established. His association with pestilence was, as we have seen, in the first instance purely fortuitous. Devout men, in seasons of pestilence, were wont to acclaim their own peculiar patron saint as a very present help in time of trouble. An altar, a church, a votive picture, a procession, these, now one, now another, were the price of the promised dispensation. But what gave permanence to the cult of Sebastian was the association of arrows with his effigy, in commemoration of his first martyrdom, as plague has been symbolized from remote antiquity as " the arrow that flieth by day." It was Apollo among the Greeks who scattered pestilence with his bow, and who was invoked also by sacrifice and hymns of praise to avert it, and in Christian hagiology and art Sebastian is the counterpart of the pagan Apollo.

The greatest of all the plague banners was destined to be also the last ; Raphael's Sistine Madonna, in which the Madonna and Child are
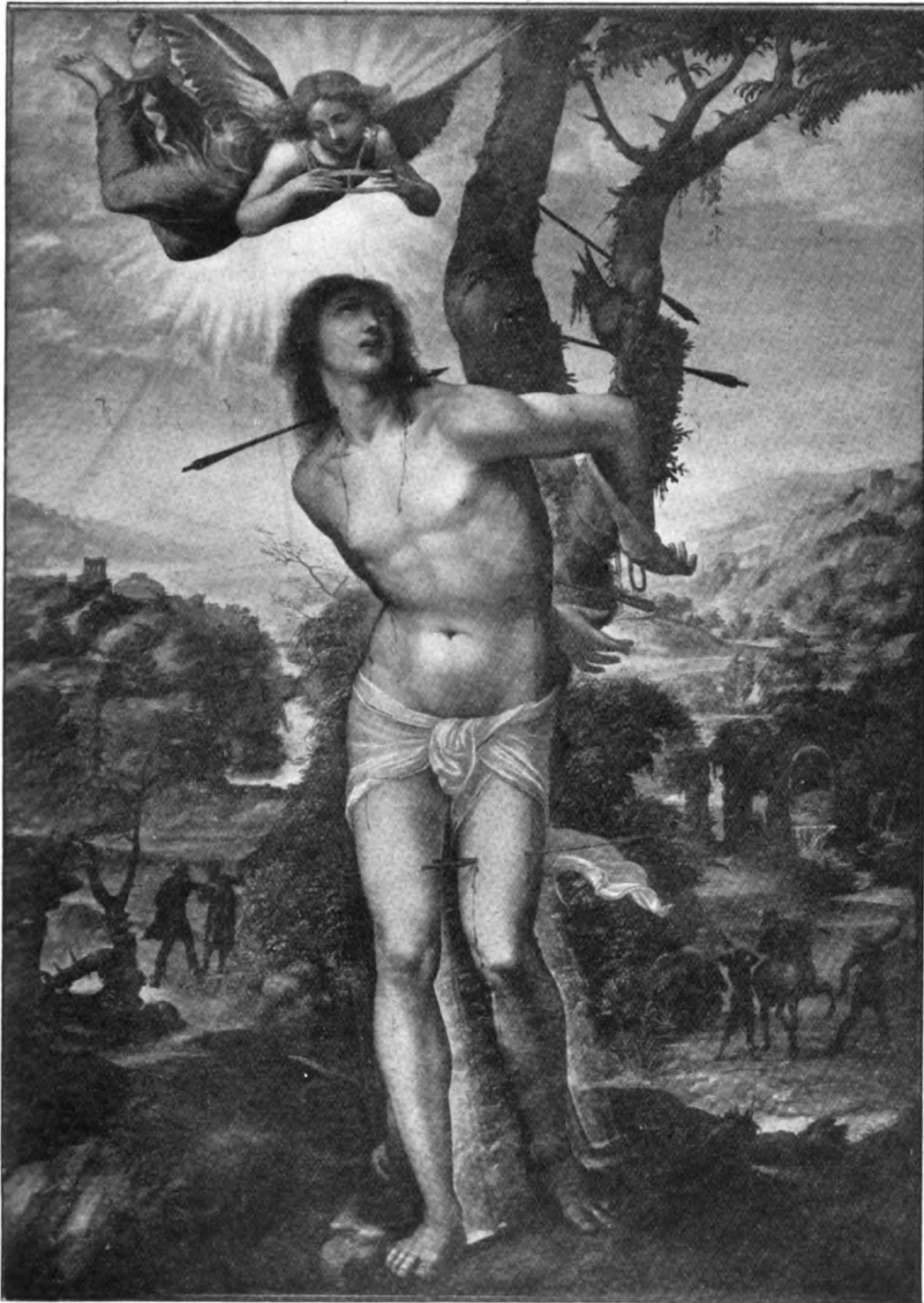
FIG. 4. [*Anderson, Rome.*

attended by S. Sixtus and S. Barbara, was painted during an epidemic of plague for the Black Friars of S. Sisto at Piacenza. No record exists that it was ever actually used for the purpose for which it was painted. Bonfigli, in the spirit of Phidias, had painted Mary the Queen of Heaven. Raphael, in the spirit of Praxiteles, had painted Mary the Mother of God. The people wanted a queen, and Raphael gave them a peasant woman. They could not see, as Raphael saw, in womanhood the embodiment of gentleness spiritualizing the brute in man. They could not see in motherhood the vision of willing suffering transfigured to joy. It was this reunion of Art with Nature that dethroned the plague banner from the affections of the common people.

Though not exclusively Perugian, nor even Umbrian, it is only in and around Perugia that these *gonfaloni* can be effectually studied. There they will be seen for the most part as framed altar-pieces in the various churches of the city and surrounding country.

Some Oddities in Nomenclature.

By B. Glanvill Corney, I.S.O.

Having occasion recently to refer to the " Chrónica geral do Brazil," by Dr. Alexandre José de Mello Moraes, for information about a certain Viceroy, I chanced upon some notes in which that author explains how the curious names given to three outbreaks of zymotic disease in the city and suburbs of Rio de Janeiro came to be bestowed.

The inaccessibility of records in the Portuguese language to many members of our profession in England must be my excuse for translating these short passages and offering them to the Section, in English. The " Chrónica " of Mello Moraes, revised by his son and published in 1886, is a work in two tomes : the first relates to occurrences between the years 1500 and 1700, the second deals with those of later date. The notes in questions are numbered 393 of 17^{00}, and 26 and 823 of 18^{00}; and are to the effect here rendered.

Note 393, of 17^{00}.—" During the Government of D. Luiz de Vasconcellos e Souza as Viceroy, in the year 1777,[1] an epidemic of a pernicious

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[1] This figure is an error, perhaps a printer's. Vasconcellos only reached Brazil in March, 1779, and took over the government a week or so later. The epidemic really began in this latter year, but continued well into 1780.

character appeared in the city and suburbs of Rio de Janeiro—an ardent fever attacking the brain and spinal medulla, which, when it did not kill the patient, left him paralysed, and even with deformities. Its causes were not understood. The physicians and surgeons of the day employed various therapeutic means to combat the evil; but all were unavailing. Experimenters who used the *herva de bicho*[1] boiled and taken in the form of a ptisan, or administered in clysters, saved their patients.

" The Viceroy ordered tar to be burnt in the streets as a means of purifying the air.

" Among those attacked by this disorder was the famous painter, Leandro Joaquim, who, being left paralysed by it, invoked Our Lady of Peaceful Death, promising to paint her portrait if he should gain relief from his affliction. And in fact he did on his recovery execute a picture representing the Lady of Peaceful Death, which is preserved above the altar of the sacristy in the chapel of her hospice.

" The people gave to this epidemic the name *Zamporinion*, after one Zamparina, a Venetian singer who, having arrived at Lisbon in 1770 (as is well known from the records of the apostolic nuncio's chancery), came on to Rio de Janeiro about the time in question.

" As she had a very fine touch, and sang admirably well, she was much in vogue at the period of this epidemic—which coincided, as it were, with her appearance on the scene—and thus it got the same name as the singer Zamporine."[2]

Dr. Sigaud mentions this name for it, in his volume on the Climate and Diseases of Brazil,[3] and attributes the epidemic to influenza; but he refers it correctly to the year 1780, instead of 1777 as stated by Mello Moraes. Writing of it as " la grippe," Sigaud observes :—

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[1] *Herva de bicho*—lit. " worm-grass " (but not the Spigelia so named)—is described by Dr. Carl von Martius, the distinguished botanist, in his " Reise in Brazilien," as a smooth-stemmed herbaceous plant of the *Polygonaceous* order, much in request in Brazil for employment as a fomentation or cataplasm in cases of arthritis, and also of hæmorrhoids, and in the early stages of *doença do bicho*. This polygonum, called by Martius *antihæmorrhoidale*, is not mentioned in Marcgrav's " Historia Plantarum." For a full botanical description of the plant see, however, Endlicher and Martius's " Flora Braziliensis," fascic. xiv, part I. *Doença do bicho* or " worm disease " is described by Piso in his " De Medicina Brasiliensi," (1648), as a severe irritation of the rectum to which negroes, particularly new-comers from Africa, are or were considered especially susceptible. It was sometimes termed *bicho de cubo* or " stool-worm," and was thought to be caused by some helminth which gained access to the intestine *per anum*. It seems not unlikely that the employment of some cleansing material culled from the " bush " by the slaves, and different from that used by the native Indians, may have conduced to contagion by that means.

[2] The variants in the spelling of this name are here copied *literatim*.

[3] " Du Climat et des Maladies du Brésil," par J. F. X. Sigaud, Par., 1844.

" Cette année elle fut d'une intensité marquée, mais il est essentiel de noter qu'elle conservait chaque année une physiognomie particulière. Dans le rapport du ,docteur Maia, présenté a l'Académie impériale de Médecine de Rio de Janeiro, il est dit que parfois la maladie prit un caractère malin et funeste.   Elle regna en 1780, et cette fois elle causait une grande altération du système nerveux et locomoteur ; elle reçut alors le nom de *zamparina*."

Neither 1777 nor 1779 was a notable influenza year in Europe ; nor was 1780, as Sigaud puts it.   The influenza years at home about that time were the winter of 1775-76, and next 1782.   But influenza continued to spread by degrees in other parts of the world ; and it is easily conceivable that, with the slow voyages customarily made by sailing vessels, some belated cases may have reached Rio de Janeiro from other places in South America or elsewhere, in either of the years mentioned.

The brief indications afforded by Mello Moraes of the characteristics of this affection nick-named *zamporinion* seem rather suggestive of cerebrospinal meningitis, and it is, naturally, possible that cases of that scourge existed concurrently with epidemic influenza.

What can be more significant than the " ardent fever, attacking the brain and spinal medulla, which, when it did not kill the patient, left him paralysed and even with deformities " ?   Even the fact that " its causes were not understood " helps to bring it into line with cerebro-spinal meningitis of more recent experience, and one might say the same of the " various " yet " unavailing therapeutic means " employed by our bygone colleagues " to combat the evil," much as we have witnessed the failure of such measures in our own day.   Sigaud's allusion to the " système locomoteur " being affected might seem to support the same view ; but though the alternative title to his volume is " Statistique médicale," he gives no mortality returns of *zamporinion*, unfortunately, and these would have been a good criterion to judge the question by.   We all know what freaks and phases influenza is apt to exhibit at the sundry periods of its recurrence, and Sigaud's · remarks above quoted follow on his descriptions of earlier visitations and varying types of that disease at Rio.   Hence it is that he draws the distinction that " cette fois " a new train of symptoms arose, and even a new popular name was assigned to the epidemic: one more whimsical, if forsooth less apt, than our curiously warm-hearted English designations from time to time bestowed on influenza, such as (in 1580) the " gentle correction," (in 1675) the " jolly rant," and (in 1678-79) the " new

delight "[1]—names which the racket and bustle of modern life seem finally to have elbowed out of remembrance in favour of a now familiar scrimped up barbarism which, since 1890-91, has become a household word; but which, saving your presence, gentlemen, I forbear to pronounce within these walls.

On the whole, perhaps, we should give the Brazilians the credit of having correctly diagnosed their own epidemic, and, therefore, I refrain from arguing a new theory about it; merely throwing out as a suggestion the view that cerebrospinal meningitis might account for the symptoms enumerated by Mello Moraes, and dubbed by the gay Rio people *zamporinion*, in compliment to the Venetian singer-lady Zamparina, whose warblings served to distract their attention from its terrors.

There is just one other point to touch upon, which is this. Measles is called in Portuguese *sarampão*, and in Spanish *sarampion*. Both are pronounced very much alike (save that the former termination carries a nasal sound), and are plausibly suggestive of etymological affinity with such a word as *zamporinion*. Excepting in sound, however, there is not really anything in common between them, the term for measles being directly derived from the Greek word ξηραμπέλινος, in allusion to the notable coloration of the rash, which is thus fancifully likened to the rufous tints of sear and withered vine-leaves familiar to all who dwell in the South of Europe.

The next note in Mello Moraes's "Chrónica" to record an epidemic is the following:—

Note 26 of 18⁰⁰.—"There appeared in Rio de Janeiro in the course of the years 1802 and 1803 a catarrhal epidemic with fever so high, and cough so similar to whooping-cough, that the persons affected by it finished by being doubled up with its violence. So that, in consequence of the bent condition in which it left them, people gave to it the name *corcunda*."

Corcunda, or *carcunda*, means in Portuguese a hump, or hunch; as an adjective it is applied to hunchbacks, being cognate with the verb *corcovar*, whence *corcovado*, "bent" or "hunchbacked." This epidemic was probably one of influenza also, but of the bronchial and pneumonic type rather than neural. Finckler[2] records the prevalence of influenza at Rio in the years mentioned, but does not name his authority.

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[1] "A History of Epidemics in Britain," by Charles Creighton, M.A., M.D.Camb., 1894.

[2] "Twentieth Century Practice," Lond., 1905, vol. xv, art. "Influenza."

Creighton[1] quotes 1803 as a remarkable influenza year in the British Isles. Of course, there may have been a prevalence of whooping-cough at the same time. In oversea countries where zymotic diseases used, in the days of sailing ship communication, to gain entry at comparatively long intervals, elderly persons were wont to suffer from it, not only very severely, but in considerable numbers. But that this particular *corcunda* was catarrhal influenza seems quite a tenable belief, for it may easily have been accompanied by cough of a paroxysmal character, which would deplete the lungs of air, whereby the chest-walls would tend to collapse, causing the patient to stoop so as to " finish by being doubled up with its violence." We are all familiar with the racking nature of the expiratory spasm in influenza; and " even in the earliest recorded epidemics special mention is made of the spasmodic character of the cough," says Finckler.[2] Short, writing in 1510, and quoted by Leichtenstern, described the cough as approaching to suffocation, and alleged that the term *coqueluche* was first applied to influenza in the epidemic of that year ; but Lobineau assigns this name as early as 1414 to the epidemic of that date, better known in France as *le tac*. Pasquier,[3] the lawyer, refers the origin of *coqueluche* to the epidemic of 1403, which he describes, and observes that it was revived in 1557 when he himself was a sufferer from the pan-European catarrhal fever which then occurred and is very amply recorded. *Coqueluche* is a derivative of *coqueluchon*, a cowl or hood, in allusion to the patients' habit of muffling up their heads and necks when suffering from influenza cough, and sensitive to chill. *Coqueluchon* is an adaptation from the Italian form, itself a mediæval expansion of *cucullus*.

Of *le tac* Pasquier says that it came into vogue in 1411, and that the fever was accompanied or succeeded by a cough so violent that " men became ruptured about their genitals," and there were instances of pregnant women in whom it caused premature delivery. He adds that it was of so universal and prostrating a nature that people used to mock one another on the subject; and it even became a common imprecation to wish your enemy might be stricken with *le tac ;* much as Shakespeare, in " Measure for Measure," makes Lucio apostrophize the Duke disguised as a friar :—

> " Why, you bald-pated, lying rascal ! you must be hooded, must you ?
> Show your knave's visage, with a pox to you ! "

[1] Op. cit.

[2] Op. cit.

[3] " Les Recherches de la France," par Estienne Pasquier, Par., 1665.

The same author quotes another epidemic, from a writer he does not name, as occurring in 1427 and known as *Ladendo,* or *la dendo*—a word which tempts one to wonder whether it can have had anything to do with¹ the terms. " dandy " or " dengue," whose derivation and exact philological meaning no one seems yet to have satisfactorily traced.

The next note I transcribe, and with which I propose to close this short sketch, relates to dengue ; it deals with the third and last epidemic recorded by Mello Moraes, and explains the quaint and inconsequent application of the term *polka* to this exanthem :—

Note 823 of 18⁰⁰.—" In the year 1847 an epidemic sickness arose to which, in Rio de Janeiro, the people gave the name *polka,* by way of commemorating a beautiful and highly fashionable young lady then at Court. This illness attacked the in'ards and the articulations ; and did not often prove fatal."

The meaning of the word *polka* is, of course, " Polish," " of Poland," but as to who this Polish young Court beauty was, or how and why she chanced to be in Brazil, Mello Moraes is silent. Nor does it seem clear—*muito bonita* as she is declared to have been—why she should bequeath her name or nationality to any fever, save of admiration ; for she could not be accused of " attacking the in'ards " (unless it might be the heart) nor the joints.

" Polka," however, is quoted in several works on medicine as one of the many by-names for dengue ; and I myself first met with it in actual use, from the mouth of a junior colleague, during an epidemic of dengue we experienced in the Fiji Islands in 1885.

It is further stated, in Mello Moraes the younger's revision of his father's book, that the 1847 visitation of dengue extended over most parts of Brazil ; and that at Bahia it was called *rabo aberto,* because of a glut in the market (of a fish of that name) which occurred at the time of its prevalence.

Portrait of Humphrie Lloyd.

MR. J. Y. W. MACALISTER showed a water-colour portrait of Humphrie Lloyd or " Llwyd " who translated the " Treasury of Health," written by Pope John XXI, and published in 1585. Lloyd was a physician and antiquary, born at Denbigh in 1527, and dying in 1568 on his way home from London, he was buried in his native town.

F—11

A Demonstration of some Eighteenth Century Obstetric Forceps.

By Alban Doran, F.R.C.S.

The three obstetric forceps which I exhibit to-day are all representatives of old types of instrument in use in the eighteenth century, but long obsolete.   The first and second were formerly included in the collection belonging to the Obstetrical Society of London and are now in the Museum of the Royal College of Surgeons of England as a loan from the Royal Society of Medicine, with which the Obstetrical Society was amalgamated.   The third was presented to the College Museum by Dr. Clement Dukes.
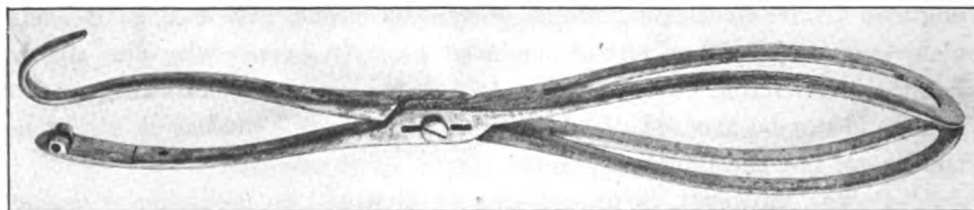
Fig. 1.

Grégoire's forceps, fitted with hinge for Freke's sharp crotchet.   Loan Collection,
Museum of the Royal College of Surgeons.

Grégoire's Forceps.

This first instrument to which I shall turn your notice this afternoon (fig. 1) is a good sample of a French forceps in general use before Levret devised the pelvic curve, independently, it seems, of Pugh and Smellie.   It is of the type of the instrument which was designed by Grégoire fils.   It differs from the Grégoire forceps represented in Mulder's standard work [1] in that the blades are much straighter and the lock is far less complicated, whilst the handle of one blade was furnished with a crotchet.   In this sample the appended crotchet has been lost, but in another preserved in the Obstetrical Museum of the University of Edinburgh (fig. 2) it remains intact, as seen in these

[1] "Historia Litteraria et Critica Forcipum et Vectium Obstetriciorum," Leyden, 1794.

photographs prepared for me by Dr. R. W. Johnstone. Freke, Surgeon to St. Bartholomew's Hospital, devised a similar crotchet arrangement, figured in a drawing of his forceps in Giffard's work, edited by Hody and published in 1734, without any detailed description. I have failed to find any other record of Freke's forceps after careful search and consultation with Sir W. Church and Dr. Norman Moore, who have traced many of Freke's surgical writings. The crotchet was formed by the handle turned inwards and bifurcated, and was covered in, when not required, by a guard, a flat, oval piece of metal attached to a pivot on the inner side of the handle. In this modified Grégoire's forceps the mechanism is different. There is, as you can see, a hinge on the extremity of the handle, turned inwards. The crotchet was a separate piece of metal, bifurcated at its free end and attached at its opposite extremity to the hinge, as the photographs from Edinburgh teach us (figs. 2, 5, and 6). There was an oval metal guard, as in Freke's forceps,
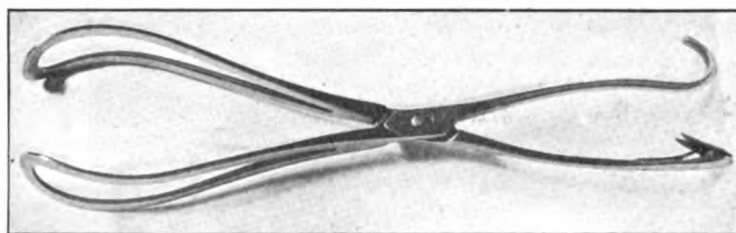
Fig. 2.

Grégoire's forceps, showing the sharp crotchet. Obstetrical Collection, Museum of the University, Edinburgh. Photographed by Dr. R. W. Johnstone. (Much reduced.)

but it was slightly concave, and arranged so as to fix the crotchet when required or to cover it in against the inner side of the handle when it was not wanted. This arrangement would seem to be an improvement on Freke's device, adapted to a French instrument. Yet it is possible that it is an original idea of Grégoire's which Freke simplified and adapted to an English forceps.

We cannot, as far as the literature of the time can indicate, feel certain that Grégoire, jun., himself did not devise or suggest this modification of his original instrument. He never published any work on his own forceps, but was saved from oblivion, indeed made famous, by Adolphus Boehmer, who had studied under Manningham, famous as the detector of the imposture of Mary Toft, the rabbit-breeding woman. Boehmer translated Manningham's work into Latin, the

title being " Artis Obstetricariae Compendium tam Theoriam quam Praxin," and it was published at Halle in 1746. Boehmer described and figured Grégoire's forceps in an appendix. A copy of Boehmer's work is preserved in the Library of the Royal Society of Medicine, but the drawing of Grégoire's forceps has been torn out. However, Mulder figures it (loc. cit., pl. ii, figs. 7 to 13), figs. 8 to 12 being devoted to the complicated lock. Kilian (" Armamentarium Lucinae Novum," 1856, pt. xiv, fig. 5) publishes one drawing of Grégoire's forceps with a lock much less complicated. A pivot projecting from the lower blade passes through a hole in the upper. This arrangement is also present in the Edinburgh Grégoire's forceps, as seen in the photograph (fig. 4—fig. 3
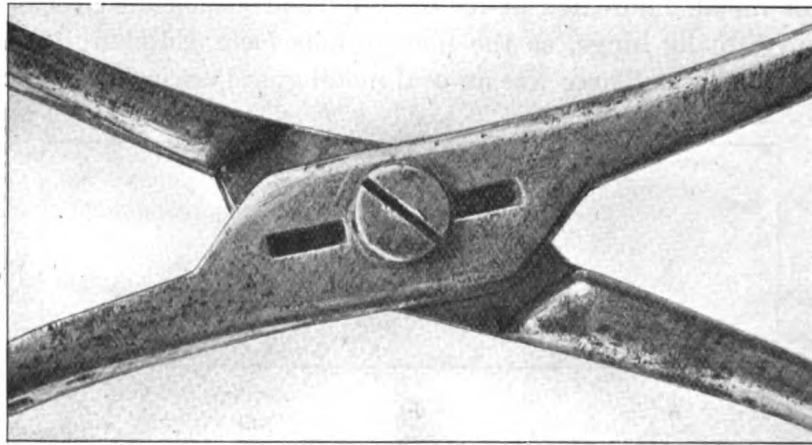
FIG. 3.

Grégoire's forceps, showing two slots divided transversely ; the screw has been fixed just below the metal crossing between them. Loan Collection, Museum of the Royal College of Surgeons.

representing the lock in the instrument now exhibited). Dr. Hellier has described and figured a Grégoire forceps belonging to the Museum of the University of Leeds[1]; the lock is of the same type and there is a sliding bolt which fits into a groove round the neck of the pivot and grasps it firmly. The pivot mechanism is also seen in the modified Dusée's forceps,[2] preserved in the Mulder Collection at Utrecht, and in

[1] " A Pair of Midwifery Forceps of Early Eighteenth Century Pattern," *Brit. Med. Journ.*, 1912, i, p. 1027. The handles are both curved outwards as in the original, and there is no arrangement for a sharp crotchet.

[2] This instrument and Burton's forceps are figured in an article on " Burton (' Dr. Slop '), his Forceps and his Foes," *Journ. of Obstet. and Gyn. of Brit. Emp.*, 1913, xxiii, pp. 3-24.

the forceps preserved in the Library of the York Medical Society, and used by Dr. Burton ("Dr. Slop" in "Tristram Shandy") in his practice, though quite different from the instrument which he invented.

In Mulder's "Historia," the most trustworthy of the earlier illustrated works on forceps, the earliest invented instrument with the pivot arrangement is Petit's (pl. iv, fig. 9), an instrument otherwise differing greatly from Grégoire's, whilst the first where it is clearly identical with the pivot lock seen in the Edinburgh forceps is Péan's (pl. vii, p. 18) ; the inventor Péan, not to be confounded with the gynæcologist who flourished at the end of the nineteenth century, was an eighteenth century obstetrician whose forceps was first ascribed to Baudelocque,
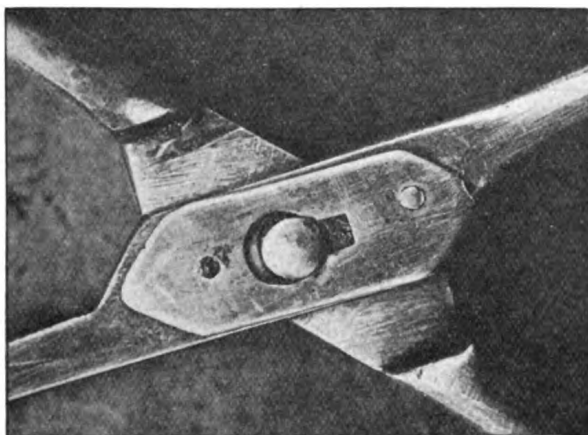
FIG. 4.

Grégoire's forceps.   Obstetrical Collection, Museum of the University, Edinburgh.

sen., father of the inventor of a well-known cephalotribe.   The former, according to Mulder, admitted Péan's priority.   Coutouly (pl. x, fig. 1) also preferred a similar lock, Kilian ("Armamentarium," pl. xvii) representing it plainly.   But it is significant that Kilian, who lived long after Mulder, represents Grégoire's forceps with the pivot just as in the Edinburgh forceps, whilst Mulder ("Historia," pl. ii, figs. 7 to 13) figures an absurdly complicated lock in his drawings of Grégoire's forceps (loc. cit., pl. ii, figs. 8 to 12).

It will be noted at a glance that the screw arrangement (fig. 3) in the lock of the modified Grégoire's forceps which I show is even simpler than the pivot in the Edinburgh sample (fig. 4).   A plain screw is fitted into a slotted joint which allows of radial deviation ; two slots are seen

in fig. 3, the lower separated from the upper by a narrow bar of metal, and the screw in the photograph has been fixed in the lower slot— namely, that towards the handle—an arrangement which suggests Dusée's forceps with two locks.[1]   As the screw bears no thumb-piece, a screwdriver must have been employed in order to fix or remove it.

These variations in the lock of several forceps of the Grégoire type suggest that it was soon found to be much too clumsy, as devised in Grégoire's original instrument.   Hence arose the adoption of simpler locks, as seen in this and the Edinburgh instrument, where a sharp crotchet arrangement is added to one handle.   Possibly Grégoire himself simplified the lock.   We only know of his original forceps through Boehmer, so Grégoire might have altered it after his German pupil had ended his pupilage.
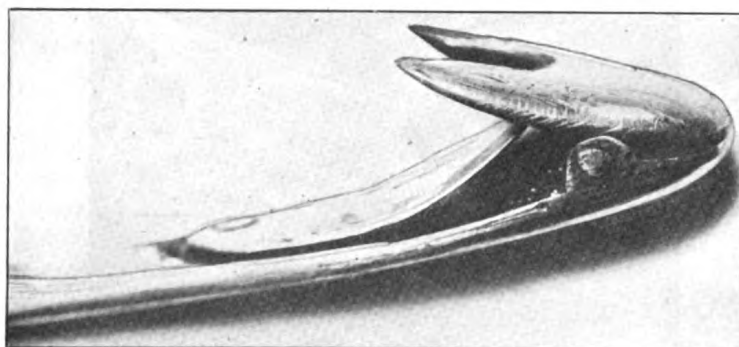
FIG. 5.

Sharp crotchet, ready for use (on No. 2).

The handle of one blade is less convex outwards in this instrument than in the typical Grégoire's forceps.   The blades are very long, $8\frac{1}{2}$ in. (21·5 cm.), measuring with the handles 1 ft. 5 in. (43·2 cm.),[2] the curve is wide, the extremities, $1\frac{3}{4}$ in. (4·4 cm.) in breadth and broader than the bases, are not curved abruptly inwards as in Mulder's drawing. The fenestræ measure in length $7\frac{1}{2}$ in. (19 cm.), and, as in the instrument drawn by Mulder, are cut square near the lock, $\frac{1}{4}$ in. (0·6 cm.) wide, not ending in a point as usual ; perhaps this was done to lighten the

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[1] *See* "Dusée : His Forceps and his Contemporaries," *Journ. of Obstet. and Gyn. of Brit. Emp.*, 1912, xxii, p. 119, and "Dusée, De Wind, and Smellie," *ibid.*, p. 203.

[2] Mulder makes out the length of the whole instrument as "15 pol."; of the blades, "$8\frac{1}{3}$ pol."

very heavy instrument as much as possible. The greatest space between the closed blades is $2\frac{3}{8}$ in. (6 cm.), whilst at their extremities they almost touch, as in Smellie's forceps. Mulder gives a space of $1\frac{1}{4}$ in. to his Grégoire's forceps. The compressive power of this instrument, which weighs 1 lb. 9 oz. (702 grm.), must have been dangerously strong.[1]

We may dismiss this forceps as a most inconvenient instrument, which was soon discarded when Levret invented his own with the pelvic curve. It must have been more awkward than Dusée's, which Smellie himself once made use of, on Butter's recommendation, and rejected, devising the pelvic curve and the long forceps. Levret almost simultaneously introduced the pelvic curve, yet his forceps was as long, if not longer, than Grégoire's.[2] The French obstetricians believed in
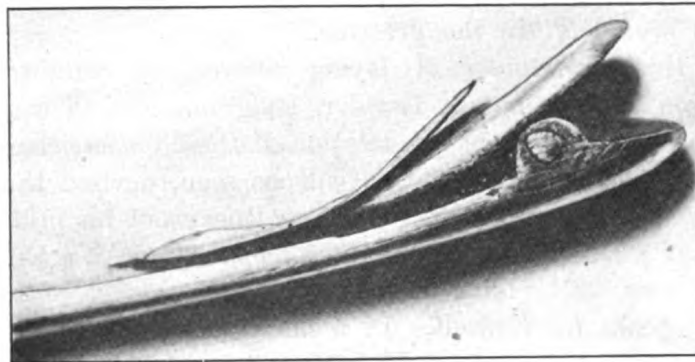
FIG. 6.

The same, closed and covered by guard.

a strong, long-handled forceps. British obstetricians, on the other hand, dreaded unduly the risks of pressure of the fœtal head and of damage to the soft parts of the pelvis through friction or slipping of the blades. Hence it will be instructive to compare this modified Grégoire's forceps with the two English eighteenth century instruments which I will now exhibit.

[1] Dr. Cordes, of Geneva, possesses a Levret's forceps which weighs 870 grm. ; it is of the same length as the Grégoire's forceps which I exhibit (17 in.), " Midwifery Forceps of Early Eighteenth Century Pattern," *Brit. Med. Journ.*, 1912, i, p. 1276.

[2] According to Mulder's tables, Levret's followers constructed forceps just as long—Petit's, 15 in. ; Coutouly's first pattern, $16\frac{1}{2}$ in. ; Péan-Baudelocque, $17\frac{1}{2}$ in., longer even than the forceps here exhibited.

Orme-Lowder Forceps.

The second instrument (fig. 7) which I exhibit this evening is also from the collection once belonging to the Obstetrical Society of London. It bears the label: " Short forceps belonging to Dr. William Ralfs, in use before 1815. Presented by his grandson, Dr. W. A. Bonney." It is of the Orme-Lowder-Haighton type, a straight and very short forceps with broad blades narrowing at the free ends, which lie far apart when the handles are closed. Its weight is 11 oz. or 312 grm. Dr. F. W. Cock informs me in a letter : " I remember my father telling me how he delivered a woman with a pair of Lowder's forceps in 1854 for a country doctor, and what a good hold they had of the child's head, unlike Denman's, which used to slip. The country doctor's predecessor, a very old man, was a Guy's or Thomas's student, and the Lowder forceps had been left ' in the practice.' "[1]

I take this opportunity of laying before you certain passages collected from the writings of Lowder, Haighton, and their pupils, as there is some obscurity about the relation of these obstetricians to their instruments ; whilst Orme, who, it will be seen, devised the original type, appears to have left no writings, the witnesses of his priority being a German and a Dutchman, just as the forceps of Dusée, a Frenchman, was made known not by himself, but by a Scotchman.[2]

Lowder speaks for himself. In a manuscript copy of his lectures on the " Theory and Practice of Midwifery," dated 1782, and preserved in the Library of the Royal Society of Medicine, the following statement is to be found : " Dr. Orme thought he could improve on Dr. Smellie by shortening the forceps further, making the blades rounder and wider towards the lock to suit the parietal bones. I thought they might be improved by locking lower down in the handle to avoid pinching the mother, but when I came to use them I found they required more force to hold them together, that what I gained one way I lost on another." A plain statement, but Lowder says no more about these forceps. He implies that Orme's modification preceded his own, and the evidence of foreign obstetricians of his day confirms the precedence of Orme. In 1783, a year after Lowder wrote the manuscript lectures, Carl Gottlob Kühn described Orme's forceps in a thesis, which was reprinted in 1827

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[1] Although the Osborn forceps which I show to-day looks light, it weighs almost exactly the same as this Orme-Lowder forceps (11 oz., or 312 grm.).

[2] *See* author, *Journ. of Obstet. and Gyn. of Brit. Emp.*, loc. cit., p. 122.

with his other works, as the "Opuscula Academica Medica et Philologica," a copy of which is preserved in the Library of the College of Surgeons. "Smellie's forceps was modified by Orme, Surgeon to Guy's Hospital, and *a Lowthero* (*sic*), the highly experienced obstetrician of the same hospital" ("De forcipe, Ormii," loc. cit., i, p. 113). Kühn, as will be explained, was not accurate as to the appointments of the two obstetricians. He states that he is not sure when the instrument was invented, nor whether the honour is to be accorded to Orme alone, or to Lowder as well.[1] Kühn describes Smellie's short forceps and Orme's forceps at great length, and figures them side by side. He dwells on the broad blades of Orme's instrument with the wide fenestræ, which, like the blades, are narrowest at the extremity, and the wide parting of the shanks above the lock (Blundell, the follower of Haighton, the successor of Lowder, we shall see, finds fault with the fenestræ as being too
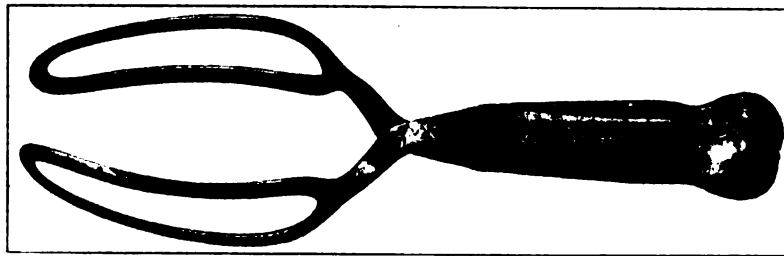
Fig. 7.

Orme-Lowder forceps. Loan Collection, Museum of the Royal College of Surgeons.

narrow). Smellie's forceps, Kühn states, has narrower blades with narrow fenestræ, widest at extremity, and the shanks do not diverge widely above the lock. When the handles are closed the extremities of Orme's blades are $1\frac{5}{8}$ in. (4·12 cm.) apart, precisely as in the forceps now exhibited, though Mulder gives a different measurement, 1 in. Kühn concludes: "Nolo jam ex his, quæ breviter de Ormianae forcipis incommodis disserui, colligere quasi animi mei hac de forcipis Smellianae immutatione sententiam. Etenim lucide apparere puto me non tantopere captum esse novitatis amore, ut vere emmendatam, et ad majorem perfectionis gradum evectam *Ormii* studiis forcipem fuisse censeam."

Perhaps the most important witness as to the development of the

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[1] Mulder, it will be shown, wrote in 1794 that Lowder's forceps had not then been described in print, admitting that Kühn had described Orme's very correctly.

Orme-Lowder type of forceps is Mulder. I therefore quote in full the experience of this authority, who was a pupil of both these obstetricians. The passage is from the " Historia Forcipum et Vectium," 1794, p. 66 ; and is also to be found in Schlegel's translation, " Geschichte der Zangen und Hebel," 1798, p. 80. A copy of the German edition is preserved in the Library of the Royal Society of Medicine ; it was formerly in the possession of Dr. Rigby, and against the reference to Kühn, 1783, quoted below, there is a pencil mark, " my MS. copy of Lowder's lectures is 1776," an important piece of evidence showing that the forceps is of older date than we might otherwise suppose. Mulder's evidence is written out clearly.

" I will now relate in chronological order what several English authorities have contributed towards the improvement of the forceps.

" First I must mention David Orme and William Lowder, who are both obstetricians in London,[1] and were my teachers when in past years I was residing there. They had made use of forceps already for several years different from any previously included in my collection. They have neither described their own instruments nor had them drawn, but in the year 1783 Karl Gottlob Kühn published a description of the first —namely, Orme's forceps—and as far as I know is the first person who ever reported the instrument in print. [In a footnote Mulder refers to Kühn's thesis and considers that the description is very correct, but the drawing poor.] As chronological order is strictly followed in this "Historia," I must place this forceps first. Lowder's forceps, which has not yet been reported or figured, I will proceed to describe on account of its resemblance to Orme's, of which it is only a variety, though, according to the time when it was invented,[2] it should not be placed immediately after the former. Orme's forceps consists of two blades which have not the new (pelvic) curve, but are straight. The blades have fenestræ, and besides being not so long, differ from Smellie's in that they are broader at the base and narrower at the tip ; whilst the latter run each from a narrow base to a broad free end. Again, the angle of divergence of the blades is greater in Orme's forceps, and the ends, which in Smellie's come close to each other, are an inch apart (when the handles are closed). The lock and the handles resemble

[1] Mulder, let it be noted, makes no mention of Guy's Hospital in reference to Orme or Lowder.

[2] Unfortunately, Mulder does not give the precise dates of the introduction of Orme's forceps and Lowder's, nor even state how many years the latter came into use after the former.

Smellie's. [Mulder adds in a footnote that Kühn is correct about these distinctions, as he has authenticated them by inspection of a genuine Orme's forceps in his own (Mulder's) possession.]

"Lowder made Orme's forceps 1 in. longer, but left it unaltered in other respects, save that he dispensed with the leather cover, of which Orme approved. Orme's intent in altering the (Smellie's) forceps was to ensure uniform pressure on the fœtal head, an aim which, as I know from experience of this instrument, he has not attained. The shortness of Orme's forceps—the shortest of all such instruments—must surprise everybody, but we need no more wonder when we bear in mind that Orme never applied the forceps until the vertex had come down to the coccyx and perineum. Lowder's alteration served to protect the soft parts of the mother, which are liable to be caught and bruised in the lock of the shorter forceps."

Mulder gives references to his own plates of Lowder's forceps which, as in the case of Orme's, he had drawn from instruments in his own possession. Further on, Mulder, writing on the fenestræ of different forceps, expresses his preference for the broad fenestra and the widening of the blade at the base—the main features of the Orme-Lowder type —to the broad extremity and narrower fenestra of the blade in older instruments, as Orme's forceps allows of better adaptation to the protuberance of the parietal bones. We shall see that Blundell dwelt, in later years, on this point.

Neither Mulder's original "Historia," published in 1794, nor J. W. Schlegel's German translation, published in 1798, make any mention of Haighton, although Schlegel notices some forceps invented since the issue of the original work. Yet this broad short type of forceps is often associated with his name.

After learning this valuable evidence of a pupil of Orme and Lowder, the instrument here exhibited (fig. 7) becomes of greater interest.[1] It seems to be a compromise, being longer than Orme's, yet the handles are covered with leather. "Involucrum coriaceum, quo gaudebat *Ormiana* rejecerit," says Mulder, of Lowder. Perhaps the leather was only rejected for the blades; I will return to this side of the question in considering Kilian's drawings. Mulder figures both forceps (Orme's, pl. v, figs. 1 and 2, Lowder's, *ibid.*, figs. 3 and 4). In this College specimen the shanks diverge above the lock even more widely

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[1] The wide fenestræ and the broad blades perfectly level on their inner surface are characteristic of this type of forceps.

than in Orme's forceps in Mulder's plate; whilst in his drawing of Lowder's forceps he makes the shanks less divergent than in Orme's.

In Kilian's "Armamentarium Lucinæ Novum," 1856—his second and corrected atlas — Orme and Lowder's forceps are figured on pl. xviii. The Orme's instrument is very like the College specimen, though the divergence of the shanks is not so marked. He represents the leather covering of the handles continued up the shanks, only ending at the base of the blades. Possibly·this was the case in the College specimen (fig. 7), as the upper part of the leather on both blades is ragged, as though it once went higher, but has broken off in course of time.

Before turning to later writers I must dwell a little on Kühn's statement as to the connexion of Orme and Lowder with Guy's Hospital and Mulder's association with those teachers. Then it will be necessary to speak of another obstetrician, Haighton.

I have endeavoured to trace Mulder's connexion with Guy's Hospital. On the title-page of his "Historia Forcipum et Vectium," he adds after his degree, " Societ. Med. Lond. in Nosocomio Guysiano Soc. honur." The Library at Guy's Hospital[1] possesses the first and third volumes of the Minutes of the Physical Society of Guy's Hospital. The first volume bears the date 1775 to 1783. Haighton joined the Society in 1778, being proposed for election by Cline. In the course of the same year Lowder was thanked for the use of his theatre, and in 1782 was President. There is no mention either of Orme or of Mulder. In 1783 Lowder seems to have been very active at the meetings, and it was in that year that Kühn's thesis was written, wherein Orme and Lowder are described as members of the staff of Guy's Hospital. The third volume of the minutes is dated 1794-98, but unfortunately the second volume is lost. It would include the meetings from 1784 to 1793—just about the time when Mulder was studying in London under Orme and Lowder. The third volume begins with the Minutes of 1794, the year in which Mulder's "Historia" was published. The loss of the intervening volume is most unfortunate. Haighton, who "improved" the Orme-Lowder forceps, read a paper on "Observations on Aneurysms" one month after his election in 1778.

I have consulted Dr. H. C. Cameron, Dean of the Medical School at

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[1] I must here express my gratitude to the Librarian, Mr. Wale, for the pains he has taken in searching for these old archives.

Guy's Hospital, and he informs me that Drs. Orme and Lowder were never on the staff of Guy's Hospital, but were lecturers in the combined schools of St. Thomas's and Guy's. Mr. Henry Williams, Clerk to the Governors, kindly showed me the list of physicians and surgeons to Guy's in the eighteenth century, and the names of Orme and Lowder are, I find, conspicuous by their absence. I have further consulted Dr. Walter Tate, Dr. E. Stainer, Mr. Ballance, and Mr. G. Q. Roberts, Secretary to the Medical School, St. Thomas's Hospital. They find that there is no recorded evidence that either Orme or Lowder were ever on the staff of that institution.

The Museum of Guy's Hospital possesses a forceps marked "Lowder," very like a Lowder's forceps in its proportions, but the blades as well as the handles are entirely covered with leather. The handles and blades are wrought in one piece, but wood is let into the metal along the handles. The blades are $2\frac{1}{2}$ in. (6·35 cm.) apart when the handles are closed. Close by it is another forceps of the Orme-Lowder type with shanks running upwards almost parallel to each other for over an inch, then they diverge at an angle of 70° to join the blade. The blade is not much broader at the base than at the free end, which lies $1\frac{1}{2}$ in. from its fellow when the handles are closed. The fenestræ are much narrower than in Mulder's type. Perhaps this is the instrument of which Blundell complains on that account. It looks more like a primitive instrument than the well-known later modifications. There remains a third forceps in this series, the most remarkable of the three. It is marked "18th Century," but bears the name "Ferguson, Giltspur Street," a maker associated with St. Bartholomew's Hospital rather than with Guy's. Possibly it is simply a recent model, made for a class. It resembles in its general characters an Orme-Lowder forceps, but bears a Brunninghausen or German lock— a pivot with a broad, flat head, $\frac{7}{8}$ in. (2·2 cm.) in long diameter, fitting into a notch in the opposite limb, and it is not lined with leather, but enamelled. The shanks, $1\frac{1}{2}$ in. long (3·8 cm.), are considerably divergent, and the fenestræ very broad. Mr. Barry Hopkins informs me that a forceps of this type was once well known in the trade, and ascribed to Brunninghausen himself. The blades are similar to those of Haighton's forceps, but longer and not so square. Haighton's name has been closely associated with this type of forceps; indeed, many dealers and practitioners took it for the generic denomination of the type, ignoring Orme and Lowder. It is, however, as may be seen at a glance (fig. 8) clearly a development of its prototype—Orme's instrument.

Although its deviser, Haighton, was a co-lecturer with Lowder, Mulder's teacher, it is not figured in the "Historia," and, strange to say, Kilian does not represent it in his "Armamentarium" (1856). Yet it was once well known in England, and in 1825 David Davis wrote of it as the widest-bladed forceps ever invented before his own.[1]

John Haighton,[2] born in 1755, lectured in conjunction with Lowder on midwifery at the united schools of St. Thomas's and Guy's Hospitals, but was never appointed physician to either. His nephew, Blundell, assisted him in his lectures in 1814, and took the whole course four years later. Haighton died in 1823. He was a distinguished physiologist and an excellent obstetric operator. Among his writings we find "An Experimental Inquiry (*sic*) concerning Animal Impregnation,"[3] and "An Enquiry (*sic*) concerning the True and Spurious Cæsarean Operation."

Dr. Fawcett and Dr. Cock, who directed my attention to the eighteenth century forceps in the Museum of Guy's Hospital, to which I have already alluded, pointed out a "Haighton's forceps" in that collection (fig. 8). Probably invented about 1790, but possibly a few years later, it is an Orme's forceps with exaggerated breadth of the blades, which are broadest at the base, but narrowing to but a slight extent towards the tips, so as to look almost oblong. The fenestræ are $1\frac{5}{8}$ in. (4·12 cm.) wide at the lowest and widest part, where the width across the blades is $3\frac{1}{4}$ in. (8·2 cm.). The shanks part widely as in the College forceps, but are thinner; the handles, on the other hand, are very similar, they are lined with leather reaching close up to the lock, and, as in this College specimen (fig. 7), it is not clear whether the leather lining ended below the lock or covered the shanks up to the base of the blades, as in the Orme's forceps figured in Kilian's "Armamentarium." The blades in the Guy's Museum forceps are $\frac{3}{4}$ in. longer than those of the College forceps and the fenestræ are broader, whilst the space between the tips of the closed blades is, on the other hand, $\frac{1}{2}$ in. less.

Unfortunately, Haighton himself has left no published account of his forceps. "A Syllabus of the Lectures on Midwifery," delivered at Guy's Hospital by Dr. Haighton, is preserved,[4] with some MS. notes

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[1] "Elements of Operative Midwifery," p. 38.

[2] Article "Haighton, John," Sir S. Lee's "Dictionary of National Biography," and Wilks and Bettany's "Biographical History of Guy's Hospital," p. 363.

[3] *Philosoph. Trans.*, 1797, lxxxvii, p. 159.

[4] In the Library of the Royal Society of Medicine.

by Blundell. The date is 1811. At p. 50 the syllabus reads : " The *Forceps :* A variety of specimens are shown and their disadvantages considered.'' Had the variety been described in detail much of the lost history of the Orme-Lowder forceps would have been saved. A valuable copy of the Syllabus bearing the date 1803, once in the possession of Dr. Harry Blaker, of Brighton, and now in the Library at Guy's Hospital,[1] and a copy of Haighton's Lectures in manuscript, in the same Library, contain much of interest, but not a word about Orme, Lowder, or their forceps.

Dr. James Blundell, born in London in 1790, studied at the United Borough Hospitals under Haighton, his uncle. He was for many years connected with Guy's Hospital as Obstetric Physician and Lecturer on Midwifery. He died in 1877, leaving a fortune of £350,000. We find in his " Principles and Practice of Obstetricy " (*sic*), 1834, p. 520, an
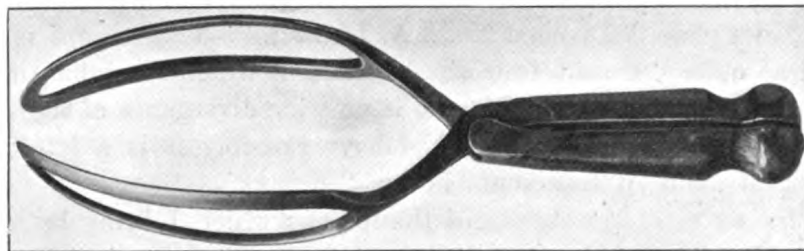
FIG. 8.

Haighton's forceps. Museum of Guy's Hospital.

important statement. Orme and Haighton are mentioned, but Lowder is ignored.

" Now, of the straight forceps there are two forms which, I think, deserve your approbation, though much nicety in the shape of the instruments is really not of much importance. The two forms of forceps are those of Dr. Orme and those of my predecessor, Dr. Haighton, a man to whom I owe everything that is good both in precept and example. Dr. Orme's forceps are to be commended for their exact adaptation to the sides of the head, and are formed with the blade of (*sic*, corrected in the second edition into ' and ') the fenestra so narrow that the opening will scarcely admit the forefinger. The main defect chargeable upon this instrument is, that when laid over the side of the head in the

[1] Presented by Dr. Galabin.

usual manner the limbus (the bar of iron forming the blade and containing the fenestra) enlarges the cranium, where if instruments really be required, it is generally already too large ; I mean over the protuberances of the parietal bones. Now Dr. Haighton's instrument has the advantage of a large fenestra, the limbus being made a little thinner ; so that the protuberance of the parietal bones lying in the fenestra on a level with the blade, or even projecting a little beyond, there is no addition of bulk over the protuberances. If there be any defect in Haighton's forceps it consists in the breadth of the blades, which is so great that they are not very easily passed up through the genital fissure." [1]

There remains some uncertainty about Haighton's forceps. It would seem, according to the evidence of his nephew and pupil, that the essential feature of his forceps was its wide fenestræ, yet Kühn made out that Orme's had wide fenestræ as an essential feature. A later writer, Radford, figures what he specifically distinguishes as Haighton's forceps in his " Essays on Various Subjects connected with Midwifery " (1839), in a plate, " Division No. 2 A, 1 and 2." The forceps is represented as quite different from the instrument which I exhibit and from Orme and Mulder's forceps. There is no wide divergence of the shanks, and the handle is much more slender. Possibly it is a late modification that Radford represents in his " Essays."

In the curve of the shanks of the forceps which I bring before you, it resembles Conquest's short forceps as figured in Kilian's " Armamentarium " (pl. xxvii, fig. 1). I have, however, read through an article written by Conquest himself, " Practical Remarks on Obstetric Instruments," in the *London Medical Repository*, March 1, 1820, where the author's short forceps is figured. The blades are much thinner than those of the College instrument and do not widen out at their junction with the shanks. Besides, the essential feature in Conquest's forceps (absent in the Orme-Lowder type) was a screw arrangment by which the upper blade could be detached from its handle so that there should be " no difficulty in introducing the upper blade of the short forceps directly over the vertex, without changing the position of the patient. After the blade is fixed the handle is to be screwed on, and the instrument used as any other " (loc. cit., p. 188). Reflecting or movable

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[1] In an American edition of Denman's " Introduction to the Practice of Midwifery " (New York, 1821), the editor, Dr. John W. Francis, observes in a footnote (p. 370) that Haighton's forceps was, at the time he wrote the note, the popular form of that obstetrical instrument in use in the United States. As said above, Haighton's name usurped that of Orme and Lowder, and hence possibly the earlier type was often misnamed in America as in England.

handles were in vogue when Conquest wrote this description of his forceps.[1]

There is no arrangement for detaching the blade in the College forceps which, according to its donor, was in use before 1815. Conquest was born in 1789, and did not take his Doctor's Degree at Edinburgh until 1813. He did not practise midwifery until a few years later. It is clear that his forceps was of an early nineteenth century type based on Orme's instrument and its modifications, though the screw arrangement represented a complete departure from the original forceps.[2]
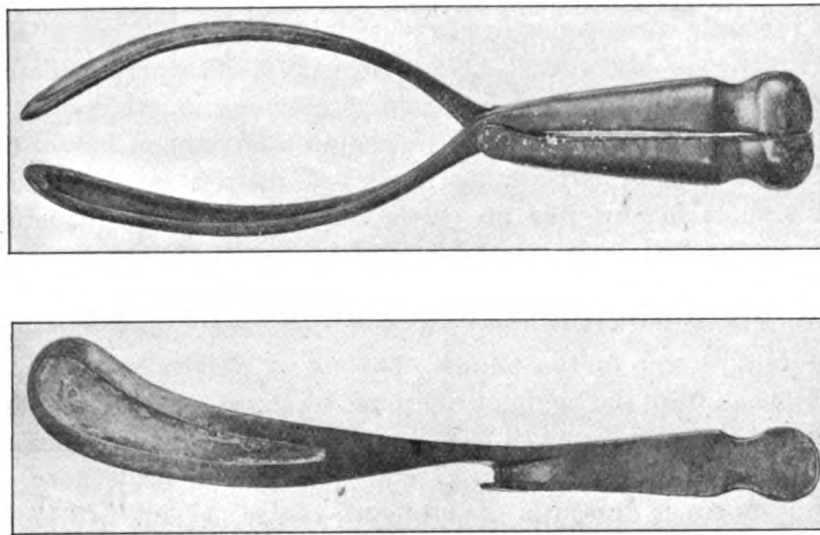
FIG. 9.

Osborn's forceps. Surgical Instrument Collection, Museum of the Royal College of Surgeons.

OSBORN'S FORCEPS.

The last instrument which I show to-day was presented to the Museum of the Royal College of Surgeons by Dr. Clement Dukes, who had received it from an old practitioner. As the great Denman testified in 1783, it is a miniature Levret, intended to combine the qualities of the long and the short forceps. Osborn's forceps (fig. 9) is

[1] *See* David Davis's " Elements of Operative Midwifery," 1825, pl. i to v.

[2] A drawing of Conquest's forceps is also to be found in his " Outlines of Midwifery," 1854, p. 134, but it is not so good as the drawing in his " Practical Remarks."

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completely enveloped in leather, fenestræ included. It is a strange thing to contemplate in these days of asepsis; yet many authorities and hundreds of practitioners used instruments of this and other types similarly covered with leather well into the middle of the nineteenth century. One of David Davis's forceps, in use in 1825, had its blades coated with two layers of leather and a third of flannel between them, and the blade bore a complicated hinge-joint near its extremity! McClintock, in the notes to his well-known edition of Smellie's " Treatise on the Theory and Practice of Midwifery," declares that in 1861, when the edition was published, the leather lining to the blades had been abandoned by all obstetricians, except Roberton, of Manchester. This forceps precisely corresponds to a full-sized drawing in Osborn's "Essays on the Practice of Midwifery" (1792) opposite p. 50, where he describes it [1] as " the instrument which I should recommend in preference to all others." He says no more about it, nor does he explain how it differs from Smellie's short forceps, an important matter, as the blades of Smellie's short forceps had no pelvic curve. In the introduction to his chapter on forceps he speaks in general terms of that instrument, how it should be adapted to the maternal pelvis, and so on. *The measurements given under Osborn's engraving correspond precisely to those of this forceps in the College Museum :* " Whole length, 11¼ in. [28·125 cm.] ; from the angle of the joint, 6¼ in. [15·8 cm.] ; handles to the angle of the joint, 5 in. [12·7 cm.]; breadth between the blades at the widest part of the curve, 2¾ in. [7 cm.]; breadth of blade near point, 1½ in.[2] [3·8 cm.]; breadth of blade at centre, 1¼ in." [3·17 cm.]. Osborn gives no other measurements. The distance between the extremities of the closed blades is ¾ in. (1·95 cm.), and the leather-covered fenestræ are 1⅜ in. (4·75 cm.) wide at their widest point. It weighs 11 oz. (312 grm.), precisely the same weight as the Orme-Lowder forceps here exhibited. Like most British forceps of its day, the handles have the usual palm-rest, and taper to the lock without any flange or finger-rest. The lock is of the English type. There is no distinction between shank and blade, and the blades, moderately broad, bear a pelvic curve, and are broadest at the end and not very far apart there when the handles are closed. It thus differs con-spicuously from the Orme-Lowder and Haighton type. Osborn, like

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[1] The quotation is from a copy of the Essays in the Library of the Royal Society of Medicine.

[2] In the College specimen it is as broad as 1⅝ in. [4·12 cm.] just 1 in. from the tip.

the better-known Denman, and a teacher called Thynne, preferred his forceps broadest at the extremity.

Osborn, we can see, did not give a full account of his forceps. The indefatigable Mulder, on the other hand, not only quotes Osborn in his "Historia," but gives a drawing of the whole forceps and of one blade placed sideways after the inventor's sketch. He quotes the "Essays" as "a very useful book," and adds, "see Osborn's drawing which represents only one arm, but when I was in London I sketched the instrument itself, as well as those of Denman and Thynne." Orme's and Lowder's instruments, we explained, were also drawn by Mulder himself. We can place much confidence in so careful an author, hence his account deserves to be quoted in full: "William Osborn, a teacher of obstetrics in London, has made use of a special forceps for several years, but only described it at the end of the year 1792 and published a drawing." Mulder's "Historia" appeared in 1794. He adds in a footnote the passage above quoted relating to the sketching of several English forceps by himself. "Osborn's forceps consists of two arms, the blades are fenestrated and have the *curvatura nova* (pelvic curve) much as in Saxtorph's.[1] The arms are united by a joint (English), and the handles are of wood. Save in some of its measurements, this instrument differs little from Smellie's curved forceps, as will be seen in my table of measurements under the names of Smellie and Osborn." Mulder then states that, like several other English authorities, Osborn never applied the forceps as long as the head was above the brim and that he applied the first blade over the fœtal ear.

Mulder's measurements are reproduced at the end of these notes. We saw that he likened Osborn's forceps to Smellie's *curved* instrument, but it will be seen that the latter, "Smellie II," measured 12½ in. The measurements of "Smellie I," the short straight forceps, correspond much more closely to his (Mulder's) measurements of the Osborn's forceps in his possession. "Forceps *Osbornii* constat ex duobus Brachiis quorum Cochlearia fenestrata curvatura habent *novam*," writes Mulder, and

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[1] Mulder gives the date of the publication of Saxtorph's forceps as 1791, Osborn's appearing in 1792. Saxtorph's was, like Osborn's, a miniature Levret, a short, curved forceps in fact (Levret I, 18 in. long; Levret II, 16¼ in.; Saxtorph, 12 in.; Osborn, 11¼ in.). Its handles were jointed so that it might be folded up and carried in the obstetrician's pocket (*see* Mulder, loc. cit., pl. vi, figs. 3 and 4). In 1866, Nyrop, of Copenhagen, exhibited a Saxtorph's forceps at a conversazione held by the Obstetrical Society of London. It is figured in the catalogue published that year. Nyrop particularly drew attention to the small pelvic curve, and declared that most old practitioners in Denmark still used it (i.e., in 1866).

" novam " is in italics in the original text.   In short, according to the testimony of Mulder, Osborn's forceps with the pelvic curve was of the dimensions of Smellie's short straight forceps.   This, it will be seen, corresponds with Denman's remarks on Osborn's instrument.   Osborn's own measurements correspond more closely than Mulder's with those of the instrument I exhibit, as will be seen from the appended tables.

The very similar forceps of Denman and Thynne were drawn *ad ipsa instrumenta* by Mulder, whilst Kilian, in his " Armamentarium," gives drawings of both and represents both (pl. xx, figs. 1 and 2) with a piece of metal in the lower part of the blade[1] cut out to lodge the leather which invested it, as it is invested in his drawing of Orme's forceps, though in that instrument there was no notch.   Mulder (" Historia," pl. vi, " Denman," figs. 7 and 8, " Thynne," figs. 9 and 10) does not represent any notch.   Neither Osborn himself, Mulder, nor Kilian, show a notch in Osborn's forceps, nor is it represented in the College specimen.   We may conclude, therefore, that the forceps was sometimes modified by the inventor himself, or altered after his death.

A few words must be said about the two other forceps just mentioned.   The measurements of all are given in Mulder's " Historia," and reproduced at the end of this communication.

We must now consider Denman himself.   We shall find that he recognized Osborn, described the precise characters of that obstetrician's forceps, and devised a forceps of his own, but we know that though short, light, and with slender blades, broadest near the free ends, like Osborn's and Thynne's, the blades were straight, and there is no evidence that Denman ever contrived a modification of his own forceps with curved blades.

Thomas Denman (1733-1815), the son of a country doctor in Derbyshire, began life as a Navy surgeon and afterwards became one of Smellie's numerous pupils.   He lectured on midwifery, and in 1769 was elected Obstetric Physician to the Middlesex Hospital, holding that appointment for nearly twenty-five years.   He distinguished himself in his advocacy of the induction of premature labour.   His son became the eminent Lord Chief Justice, Lord Denman, and one of his twin daughters married Matthew Baillie, the other becoming the bride of the ill-fated Sir Richard Croft, who attended the Princess Charlotte and committed suicide.   Had he made use of his father-in-law's forceps how English history would have been altered !   That Denman was an

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[1] In Osborn's, Thynne's and Denman's forceps there is no conspicuous distinction between shank and blade, so prominent in Orme's instrument.

eminent man there can be no doubt. He was apparently the first to interpret the true nature of the "snuffles" in syphilitic infants. He was far better known and has been much longer remembered than the two other obstetricians who contrived short light forceps. He testifies to Osborn's priority as early as in 1783.[1] "The curve of the Levrett's (*sic*) forceps seems the most convenient and Mr. (*sic*) Osborn has contrived a very elegant pair, by diminishing the size of Levrett's and very little alteration besides." Thus he advocated a short forceps *with* the pelvic curve. Denman's own views of the use of the forceps are well known. They are most conveniently arranged in detail in the second edition of his "Introduction to the Practice of Midwifery" (1801). He commends Smellie as the inventor of a "kind of forceps more convenient than any before contrived" (loc. cit., p. 98), and does not speak of his own modification. In looking over the fifth, or 1805, edition, I find on p. 357, in his chapter "On the Forceps," the following important statement: "The *common curvature* was varied according to the opinion entertained of the form and dimensions of the head of a child at the time of birth ; but the *lateral curvature* was given for the accommodation of the instrument to the form of the pelvis, or for lessening the pressure, and of course the danger, of lacerating the external parts whilst the child was extracting." Then Denman proceeds to commend Smellie's instruments as "being simple in their (*sic*) construction, applicable without difficulty, and equal to the management of *every case in which the forceps ought to be used.*" Lastly, Denman states that "I have, with *very little alteration,* adapted the following *rules* to them."

In the above quotations the italics are my own. Denman, as we learn from the last sentence, did not even allude to his modification of Smellie's forceps, for his "very little alteration" referred to the "rules" for application of that instrument of Smellie's. But, writing earlier in 1783, Denman advocated Osborn's forceps, which he rightly described as a miniature "Levret," which had the pelvic curve. In the 1805 edition of his Introduction he speaks of the "lateral curvature," apparently with approval, and forthwith teaches that Smellie's forceps was fit for "every case in which the forceps ought to be used." There is some obscurity here, but most reasonably we may assume that Denman was referring to Smellie's *curved* forceps.

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[1] This quotation is taken from "A Vindication of the Forceps described and recommended by Dr. Leake : by a late Pupil of Dr. Leake's," 1783, p. 19. Leake devised a three-bladed forceps.

Yet by " Denman's forceps " we generally understand a short instrument with blades rather slender and broadest at the free ends, as in Smellie's, and unlike Orme's, and with a space between the free ends when the handles are closed as in Orme's but not in Smellie's. The blades, however, are straight, that is, there is no pelvic curve. *On donne toujours aux riches.* There seems to be an idea that Denman devised another short forceps *with* the pelvic curve. I suspect Osborn's has been ascribed more than once to Denman. Osborn preceded him; he was born in 1732 and was a pupil of Levret's and also of William Hunter's. Now we can see that Denman's observations above quoted implied that Osborn's forceps was constructed before his own, just as Lowder admitted in his lectures that Orme was his predecessor. Denman, born in 1733, was only one year younger than Osborn and studied under Smellie, but he became a Navy surgeon and took to the practice of obstetrics later than the less remembered obstetrician.

Mulder's description of Denman's forceps, as he carefully compared the three instruments, deserves to be reproduced : " Although Thomas Denman, teacher of obstetrics in London, contended that the vectis was safer and more handy and, indeed, preferable in certain cases, nevertheless, a forceps bearing his name is known in London and he is accustomed to use it. This instrument has two arms with straight, fenestrated blades. They are joined by an English lock and the handles are wooden. They differ from Smellie's forceps mainly in the relation of the handles to the blades, in the distance of the blades from each other and in their breadth, all made clear in the tables of measurements." Mulder says nothing about a pelvic curve, and represents Denman's forceps as straight. As Dr. F. W. Cock informs me, there is a genuine Denman's forceps, still partly covered with leather, in the Museum of Guy's Hospital, the property of the late Dr. Tait, about 1837.

Thynne has sunk into oblivion even deeper than Osborn. The Library of the Royal College of Surgeons possesses a quarto note-book. On one back is written, " Lectures on the Theory and Practice of Midwifery and the Diseases of Women and Children, by Drs. Osborn and Clarke, 1790-1791, in two Books—Book 2nd." On the opposite back is written, " Abstract of Dr. Thynn's Lectures, 1805." In neither manuscript abstracts is there any allusion to the place where the lectures were delivered, and as for orthography, it is not clear whether that of the writer or that adopted by Mulder is correct. The Thynn end, as we may rightly call it, of the note-book concerns us at present. There is no mention of forceps except at p. 36. " The forceps he described as

a very useful and safe instrument, the *(sic)* were invented by Chamberlen and much improved by Smellie." There is no allusion to Thynne's own or any other special kind of forceps. On the Osborn-Clarke side of the note-book there is nothing about any forceps. Osborn, the annotator records, taught his pupils that the habit of drinking "is certainly the worst thing that a medical man can be guilty of, *as it always must*

TABLE OF MEASUREMENTS OF FORCEPS.

	Length of forceps	Length of blade	Length of handle	Greatest breadth of blades	Distance of broadest part from tip	Greatest space between blades	Distance between tips when closed	Length of fenestra	Greatest breadth of fenestra
	in.	in.	in.	in.	in.	in.	in.	in.	in.
Grégoire, Mulder	15	8⅓	6¼	1⅔	1	2⅛	1¼	5⅕	⅝
Grégoire, Museum of the Royal College of Surgeons	17	8½	8½	1¾	2	2⅔	None	7½	⅞
Smellie I (straight), Mulder	11	6½	4½	1⅙	1¼	3⅔	None	4	¾
Smellie II (with pelvic curve), Mulder	12½	7¾	4¾	1⅓	1¾	3¼	None	5	¾
Orme, Mulder	10⅓	5⅚	4½	1½	3¼	2¾	1	3½	⅝
Lowder, Mulder	11⅓	6½	4⅗	1½	4	3 1/12	⅔	4½	1 11/12
Orme-Lowder, Museum of the Royal College of Surgeons	11	5½	5½	1¾	4	3¼	1⅗	4¼	1⅕
Haighton, Guy's Hospital	11	6¼	4¾	1⅞*	4	3¼	1⅛	4½	1⅞
Osborn, Mulder	11¼	6¾	4½	1⅓	1⅙	3¼	1/12	4⅓	1 1/12
Osborn, Museum of the Royal College of Surgeons	11¼	6¼	5	1⅝	1	2¾†	¾	4¾	1
Denman, Mulder	10¾	6 7/12	4⅚	1 1/11	1⅙	3 1/12	⅙	4½	1 1/12
Thynne, Mulder‡	11	7	4	1⅓	1⅙	3¼	1/12	4 5/12	1½

* In the original "Haighton" the blades, very broad, diminished but little towards the tip.

† Same as in Osborn's "Essays." Mulder makes this measurement half an inch more.

‡ Mulder's "pol." is rendered as "in." (inch) throughout. The actual length of a Dutch inch being uncertain and the majority of these measurements being taken from the "Historia Forcipum," "pol." has not been reduced to centimetres.

cut up his practice." Then he mentions the name, we regret to say, of a misguided obstetrician who attempted version when under the influence of alcohol and ruptured the uterus.

Mulder, it will be seen, teaches us more about Thynne's instrument than can be learnt from the scanty records left by that obstetrician himself. "Thynne, a teacher of obstetrics in London, makes use of

a forceps which closely resembles Osborn's.   The blades are, as in the latter, fenestrated, and are also curved.   The lock is likewise a hinge (Mulder means an English lock without a pivot, such, as he shows, was adopted by Chapman and then by Smellie), and the handles are also wooden.   The main difference is that in Thynne's forceps the proportion of the blades to the handles is greater,[1] and the distance between the blades at the tips is wider, whilst, on the other hand, the angle at which the blades diverge is less.

Medical Allusions in the Writings of Francis Bacon.

By G. W. Steeves, M.D.

THE subject which I have chosen is a very wide and comprehensive one, and even for our present purpose a survey of those works which may be considered the " true and authentic " writings of Francis Bacon will perhaps more than tax our powers of inquiry and patience; therefore, I may at once dispel all fear by stating that it is not my intention to include any references, however interesting, from the pages of such authors as Shakespeare, Spencer, or even Robert Burton.   These must be left to those enthusiastic controversialists who place the great philosopher on an even higher pedestal than I do.

We need not wonder that a man with such philosophic attainments, such powers of observation and love of experimental science, has left in various portions of his voluminous writings evidences that the science of medicine has not escaped his notice.   Indeed, there is scarcely any Baconian work of importance where some interesting reference to medical science may not be found.   In a general way Bacon seems to have been well versed in the writings of Hippocrates, Celsus, Galen, and others who followed them, and those of his own day had evidently been duly and critically investigated by him : so that in many places we find him speaking as if he were an astute physician rather than the leading philosophic light and legal exponent of the period.

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[1] *See* " Tables of Measurements " (p. 75).   Though Thynne's forceps was only 11 in. long the blades took up 7 in.   In Saxtorph's, the first miniature Levret (*vide supra*), the instrument was 12 in. long, yet only $6\frac{3}{4}$ in. were taken up by the blades.   Osborn's had blades $6\frac{3}{4}$ in. in length, whilst its entire length was $11\frac{1}{4}$ in.   Thus his blades were proportionately longer than Saxtorph's, and Thynne's were proportionately and absolutely longer than Osborn's or Saxtorph's.   It is unfortunate that no record of an unprejudiced and experienced critic as to the relative merits of these three miniature Levret's forceps has been preserved.

For convenience it will be well to consider our subject under the following heads :—

(1) Bacon's mental attitude towards the profession, and the duties pertaining to it.

(2) His views on public and domestic hygiene.

(3) Remarks on disease in general, and special diseases.

(4) Medicines and special medical applications.

(5) The special senses.

(6) Generation, decay and death.

Let me at once quote a few noble lines from the preface of his " Maxims " which every medical man might well take to heart as he enters upon his life's work. Bacon speaks as follows : " I hold every man a debtor to his profession, from the which as men of course do seek to receive countenance and profit, so ought they of duty to endeavour themselves, by way of amends, to be a help and ornament thereunto. This is performed in some degree by the honest and liberal practice of a profession, when men shall carry a respect not to descend into any course that is corrupt and unworthy thereof, and preserve themselves free from the abuses wherewith the same profession is noted to be infected ; but much more is this performed if a man be able to visit and strengthen the roots and foundation of the science itself ; thereby not only gracing it in reputation and dignity, but also amplifying it in perfection and substance."

Bacon never ceased in his efforts to advance the cause of science, and those departments which fostered and in any way pertained to medicine received special recognition from him. In the " Novum Organum " he refers to natural philosophy—" the great mother of the Sciences," as he terms it—being made " to wait upon Medicine." And again speaking of the advancement of Science, he says : " Let no one expect any great progress in the Sciences (especially their operative part) unless natural philosophy be applied to particular sciences, and particular sciences again referred back to natural philosophy. For want of this, astronomy, optics, music, medicine itself have no depth, but only glide over the surface and variety of things. . . . We can little wonder that the Sciences grow not when separated from their roots." Then later, applying his induction, he adds : " For the discovery and demonstration of the arts and sciences should separate Nature by proper rejections and exclusions, and then conclude for the affirmative after collecting a sufficient number of negatives." After such a passage as this it is impossible to over-estimate the value of Bacon's method of

reasoning in our own special department of medicine. He, indeed, emphasizes what he admits Plato may have attempted.

Locke said: "Were it my business to understand physic, would not the safer way be to consult Nature herself in the history of diseases and their cures?" So in his "Advancement of Learning" we find Bacon going to the root of the matter, as he usually did. Let me quote a passage: "Physique, taking it according to the derivation and not according to our idiom for medicine, is situate in a middle term or distance between Natural History and Metaphysique. For Natural History describeth the variety of things; Physique, the causes, but variable or respective causes; and Metaphysique the fixed and constant causes." In a letter to Father Baranzano in the year 1622, referring to Physics in the wider scientific sense, he says: "When true Physics have been discovered there will be no Metaphysics. Beyond the true Physics is Divinity only." In portions of Bacon's works we have ample evidence of the fact that although his ideals were of the highest order, he recognized that the doctors of his day were not without their frailties and shortcomings. While in the "Advancement of Learning" he says: "This subject of man's body is of all other things in nature the most susceptible of error. For the same subtilty of the subject doth cause large possibility and easy failing; and therefore the inquiry ought to be the more exact," we read in his "Filum Labyrinthi": "The physician pronounceth many diseases incurable, and faileth oft in the rest." And again, in the same treatise, he adds: "Men strive against themselves to save the credit of ignorance, and to satisfy themselves in this poverty. For the physician, besides the cautels of practice, hath this general cautel of art, that he dischargeth the weakness of his art upon supposed impossibilities: neither can his art be condemned when itself judgeth. The old English word "cautel" which Bacon uses twice in this passage, we also find in Shakespeare, conveying the same meaning. For instance in the passage:—

> "No soil nor cautel doth besmirch
> The virtue of his will."

Let me add one of his metaphors; it is taken from the "Wisdom of the Ancients": "In every knowledge and science, and in the rules and axioms appertaining to them, a mean must be kept between too many distinctions and too much generality, between the rocks of the one and the whirlpools of the other. For these two are notorious for the shipwreck of the wits and arts."

Bacon was quite alive to the difficulties that medical men of his day had to contend against, and the imposture that constantly arose to defeat their art. Allow me to quote a passage or two from the " Advancement of Learning " apropos of this : " The Poets did well to conjoin Music and Medicine in Apollo : because the office of medicine is but to tune this curious harp of man's body and to reduce it to harmony. So that the subject being so variable, hath made the Art by consequence more conjectural ; and the Art being conjectural hath made so much the more place to be left for imposture. For almost all of the Arts and Sciences are judged by acts, or masterpieces, and not by successes and events. . . . The physician is judged most by the event, which is ever but as it is taken : for who can tell if a patient die or recover. . . . And, therefore, many times the impostor is prized and the man of virtue taxed. Nay we see the weakness and credulity of men is such, as they will often prefer a mountebank before a learned physician. . . . For in all times, in the opinion of the multitude, witches and old women and impostors have had a competition with physicians."

For other matters of interest in connexion with this portion of our subject I must refer you to Bacon's work itself. I need only add in passing that three hundred years have not deprived us of those witches, old women and impostors, and that the competition to which Bacon alludes more than survives at the present day.

Under the " Fable of Prometheus or the State of Man " Bacon concentrates a thought, embodied in a quaint humour, which will interest some sections of our fraternity even now. He says : " For my own part I certainly think that those two faculties—the Dogmatical and the Empirical—have not yet been well united and coupled ; but that the bringing down of new gifts from the gods has ever been left either to abstract philosophers, as to a light bird, or to sluggish or tardy experience, as to an ass. And it must be said in behalf of the ass, that he might perhaps do well enough but for that accident of thirst by the way. For if a man would put himself fairly under the command of experience, and proceed steadily onward by a certain law and method, and not let any thirst for experiments either of profit or ostentation seize him by the way and make him lie down and unsettle his burden in order that he may taste them, such a man I do think would prove a carrier to whom new and augmented measures of Divine bounty might be well enough entrusted."

In the same discourse we shall find a most interesting allusion to the physical state of man and his mental possibilities—as follows : " Nor is

it without meaning that in the mass and composition of which man was made, particles taken from the different animals were infused and mixed up with the clay : for it is most true that of all things in the Universe man is the most composite, so that he was not without reason called by the Ancients the little world.   For, although the Alchemists, when they maintain that there is to be found in man every mineral, every vegetable, &c., or something corresponding to them, take the word microcosm in a sense too gross and literal, and have so spoiled the elegance and distorted the meaning of it; yet that the body of man is of all existing things both the most mixed and the most organic, remains not the less a sober and solid truth.   And this is indeed the reason it is capable of such wonderful powers and faculties."

The chief object of Bacon's philosophy must be evident to all : that he has distinctly advanced the cause of scientific medicine by such methods as we find repeated through his voluminous treatises we must all agree.   He took a strong stand against the old process of reasoning and the previous philosophical methods which proceeded from insufficient data or hypotheses without any foundation of fact.   He attempted to make evident, and once for all banish, the pitfalls of syllogistic reasoning, the conclusions of which could only be founded on unreliable premises ; alone being content to go back to " first principles," and then proceeding by a scientific and true method of deduction.   This, indeed, was the true aim of his work.   Thus would his observations and experiments provide a sure basis for reasoning, and surely we must acknowledge that he did much to establish this great lesson, without which no true advance in any science can be made.   His object is well described in a few lines by Macaulay, when he says :   " In Bacon's opinion philosophy was made for man ; it was a means to an end, and that end was to increase the pleasures and mitigate the pains of millions, who are not and cannot be philosophers."

Before leaving this part of our subject I must refer to the opinion of Bacon as expressed in the " Advancement of Learning," with reference to the remuneration of professors, &c.   It would seem, from his observation, that this class had as little consideration then as now.   He says : " Because founders of colleges do plant, and founders of lectures do water, it followeth well in order to speak of the defect which is in public lectures ; namely, in the smallness and meanness of the salary or reward which in most places is assigned unto them ;   whether they be lectures of arts or of the professions.   This cannot be, except their condition and endowment be such as may content the ablest man to appropriate his

whole labour." Later he adds ; " So as, if you will have the sciences flourish, you must observe David's military law, which was—That those which stand with the carriage should have equal part with those which were in the action, else will the carriages be ill attended."

I should like to add Bacon's advice to the patient on his selection of a doctor. You will find it in the essay of " A Regimen of Health," where he says ; " Physicians are some of them so pleasing and comfortable to the humour of the patient, as they press not the true cure of the disease ; and some others are so regular in proceeding according to art for the disease, as they respect not sufficiently the condition of the patient. Take one of a middle temper ; or if it may not be found in one man, combine two of either sort ; and forget not to call as well the best acquainted with your body, as the best reputed of for his faculty."

Bacon seems to have very thoughtfully considered the patient's interest and point of view, and in several places he throws out suggestions as to how they ought to receive the directions of their medical men : for, again, in the " Advancement of Learning " we find this passage : " Although a man would think, by the daily visitations of the physicians, that there were a pursuance in the cure : yet let a man look into their prescripts and ministrations, and he shall find them but inconstancies and every day's devices, without any settled providence or project. Not that every scrupulous or superstitious prescript is effectual, no more than every straight way is the way to Heaven ; but the truth of the direction must precede severity of observance."

This quotation fairly well sums up his own feelings, and on the whole cannot be considered too flattering towards the profession : at the same time it emphasizes the necessity of confidence on the part of the patient as the initial step toward the cure.

The second portion of my thesis refers to Bacon's allusions to *public and private hygiene.*

In the year 1623 he issued his " Historia Vitæ et Mortis." It was an effort to which he himself attached much importance, dealing as it did with " the prolongation and setting up of human life," and it was prepared with the greatest care. In it he describes how the processes of life influence longevity, and he attempts to establish a theory of the presence of a " Vital Spirit " permeating all animals and plants. He formulates certain " Articles of Inquiry " which he considers necessary in the consideration of the prolongation and restoration of life. Here are some passages from this remarkable work : " Inquire into the length and shortness of life with the proper circumstances which seem to

contribute to them.   Inquire into the length and shortness of men's lives according to the times, countries, climates and places in which they were born and lived, to their food, diet, manner of living, exercise. With regard to the air in which they live and dwell.   Into their studies, kinds of life, affections of the mind and various accidents.   Into the medicines which are supposed to prolong life.   Into the signs and prognostics of a long and short life.   Into those which appear and are observed even in health, whether taken from physiognomy or otherwise. Into the things which preserve and exempt the body of man from arefaction and consumption, or at least which check and retard the tendency thereto.   Into the things which belong to the general process of alimentation, that it may be good and with as little loss as possible. Into the things which clear away the old matter and supply new, and every kind of death by privation and want," &c.

Then again he ventures on many points some of which may appear to us fantastic and unreasonable at the present day, but display great insight and observation.   He states : " Early and late baldness is a thing immaterial, for many bald men have been long-lived.   Nor are early grey hairs (though they appear to be the precursors of old age) any sure sign.   Premature greyness without baldness is a sign of longevity.   A moderate-sized neck, neither too long and slender, nor too thick and sunk into the shoulders, wide nostrils, a large mouth, ears gristly, not fleshly, teeth strong and close set, are signs of long life, and much more so if the new teeth come late in life.   Also a broad chest, a flat stomach, a large hand.   Thighs not very fleshy.   A calf not droop- · ing but firm.   Senses not too acute.   A pulse slow in youth, but quicker as age increases.   A power of holding the breath easily and long.   The bowels more costive in youth.   A life spent in religious and holy offices seems to contribute to longevity.   A country life in the open air, not indolent but active, living generally on fresh and home-made food, and free from care and envy.   I am in some doubt whether frequent bleeding tends to longevity, but I am rather inclined to believe that it does, if it be turned into a habit, and other things are favourable thereto."

This learned discourse also emphasizes the importance of pure drinking-water, a hard couch, cold air, a spare diet, few sensual pleasures, avoiding too much exercise and all fatigue.

In his " Sylva Sylvarum," Bacon discusses his experiments on " Exercise of the Body," and on certain forms of food, such as bread, fats, sweets, &c., and also describes those conditions which induce and

accelerate putrefaction in bodies, as well as those surroundings which prohibit and check it. In this work, in addition to many pertinent allusions, it is interesting to notice his remarks on the selection of water. He mentions spring-water, rain-water, snow-water, &c. With reference to the latter, he says that it is unwholesome ; insomuch as the people that dwell at the foot of the snow mountains (especially women) by drinking of snow-water have great bags hanging under their throats." Later, he says : " Springs on the tops of high hills are the best—are more pure and unmingled. Waters in valleys join in effect underground with all waters of the same level. Judgment may be made of waters by the soil whereupon the water runneth, as pebble is the cleanest and best tested, and next to that clay water, and thirdly waters upon chalk, fourthly upon sand, and worst of all upon mud. Neither may you trust waters that taste sweet, for they are commonly found in rising grounds of great cities, which must needs take in a great deal of filth."

The situation of the house and the conditions which may affect the air, &c., are referred to in his essay of " Building." Here we read : " He that builds a fair house upon an ill seat committeth himself to prison. Neither do I consider it an ill seat only where the air is unwholesome ; but likewise where the air is unequal ; as you shall see many fine seats set upon a knap of ground environed with higher hills round about it, whereby the heat of the sun is pent in, and the wind gathereth as in troughs, so as you shall have, and that suddenly, as great diversity of heat and cold as if you dwelt in several places. Neither is it ill air only that maketh an ill seat, but ill ways, ill markets, and if you will consult with Momus, ill neighbours. I shall not speak of many more ; want of water, want of wood, shade and shelter, want of fruitfulness and mixture of ground of several natures, want of prospect, want of level grounds, want of places for sports, &c. . . . having the commodity of navigable rivers, or the discommodity of their overflowing."

It is interesting to notice that in the " New Atlantis," which is supposed to have suggested the foundation and programme of our own Royal Society, Bacon attempts to picture an ideal institution under the designation of Solomon's house. In the description of this fair commonwealth, among other means for the prevention and cure of disease the father of the house adds : " We have also certain chambers which we call Chambers of Health where we qualify the air as we think good and proper for the cure of divers diseases and preservation of health." Under this head Mr. Spedding in the year 1857 makes the following

note: " This experiment has been tried, especially by Dr. Beddoes, of Clifton, but without any marked result.   Some relief has been obtained in cases of phthisis by inhaling oxygenated air." In this "New Atlantis" there are also provided "fair and large baths of several mixtures, for the cure of diseases and the restoring of man's body from arefaction; and others for the confirming of it in strength of sinews, vital parts and the very juice and substance of the body. . . . We have also helps for the sight far above spectacles and glasses in use. We have also glasses and means to see small and minute bodies perfectly and distinctly, as the shapes and colours of small flies and worms, &c., observations in urine and blood, not otherwise to be seen. We represent also all manner of reflections, refractions and multiplication of objects." Spedding very appropriately observes that "Nothing that has been accomplished with the microscope would have interested Bacon more than the discoveries of Schleiden and Schwann."

It would, indeed, almost seem that to Bacon's keen insight was added the gift of prophecy. This "New Atlantis" is a wonderfully suggestive study, and its perusal will amply repay any thoughtful reader. In many of his *essays* Bacon frequently takes the opportunity of introducing subjects which bear directly and indirectly on general and personal hygiene. I would direct your attention to that on "Regimen of Health," and I need only quote two or three passages from it. He says: "A man's own observation, what he finds good of, and what he finds hurt of, is the best physic to preserve health. . . . Discern of the coming on of years, and think not to do the same things still; for age will not be defied. . . . Beware of sudden change in any great point of diet, and, if necessary, enforce it, fit the rest to it. . . . Examine thy customs of diet, sleep, exercise, apparel, and the like, and try in anything thou shalt judge hurtful to discontinue it by little and little. . . . To be free-minded and cheerfully disposed at hours of meat, and of sleep and of exercise, is one of the best precepts of long-lasting. . . . Despise no new accident (he means any striking change in the constitution) in your body, but ask opinion of it " (that is take medical advice). He quotes Celsus in this discourse as to how a man may best direct his own health, but I must refer you to the essay itself. In the essay on "True Greatness of Kingdoms and Estates" we find the subject of *exercise* again discussed. He adds here: "No body can be healthful without exercise." In that on *studies* also we read: "Abeunt studea in mores" (studies become habits). "Nay there is no stond" (that is, hindrance), "or impediment in the wit, but may be wrought out by fit

studies, like as diseases of the body may have appropriate exercises. Bowling is good for the stone and reins" (that is, kidneys). "Shooting for the lungs and breast; gentle walking for the stomach; riding for the head and the like. . . . Every defect of the mind may have a special receipt." Again in his item on *ceremonies and respects* he says: "A wise man will make more opportunities than he finds. Men's behaviour should be like their apparel, not too straight or point device, but free for exercise or motion." In that of *dispatch*: "Affected dispatch is one of the most dangerous things to business that can be. It is like that which physicians call *predigestion*, or hasty digestion, which is sure to fill the body full of crudities and secret seeds of diseases." Speaking of *friendship*, and the abuses often arising from false advice, he says: "We may have counsel given hurtful and unsafe (though with good meaning) and mixed partly of mischief and partly of remedy; even as if you would call a physician that is thought good for the cure of the disease you complain of, but is unacquainted with your body; and therefore may put you in a way for present cure, but overthroweth your health in some other kind; and so cure the disease and kill the patient."

Bacon's allusions to Food and Nutrition are not infrequent, and he takes many opportunities of stating his views regarding *affinity* and *assimilation*. In more than one place he attempts to explain the *process of nutrition*, coupled with a comparative study of animals and plants, and in this connexion I may quote one passage from the "Novum Organum," where he says: "The solid parts of plants and animals as the leaf, flower, the flesh, bone, and the like, each of them assimilate some part of the juices contained in their food, and generate a successive and daily substance. For let none rave with Paracelsus who (blinded by his distillations) would have it that nutrition takes place by mere separation, and that the eye, nose, brain, and liver lie concealed in bread, meat, &c., asserting that just as the artist brings out a leaf, flower, eye, nose, hand, foot, from a rude mass of stone or wood by the separation and rejection of what is superfluous, so the great Artist within us brings out our several limbs and parts by separation and rejection. But to leave such trifling, it is most certain that all the parts of vegetables and animals, as well the homogeneous as organic, first of all attract juices contained in their food, which are nearly common, or at least not very different, and then assimilate them and convert them into their own nature. Nor does this assimilation or simple generation take place in animated bodies only, but the inanimate also participate in the same property."

F—13

In his " Historia Ventorum," Bacon discusses the origin, directions, humidity and dryness of winds, and also explains how natural ventilation in a house may be produced.   Allow me to quote one passage from this work: " Sea winds are doubtless moister than land winds, but yet purer, and more easily and equally mixed with pure air.   For land winds are compounded of deleterious mixtures, and are full of smoke. And let no one oppose to this, that sea winds must be heavier by reason of the saltness of the sea ; for salt being in its nature terrestrial does not rise in vapours.   Sea winds are warm or cold, according as they are moist or pure.   Cold is lessened by humidity (for dryness intensifies both heat and cold) but increased by purity.   .   .   .   All winds clear the air and free it from corruption, so that those are the healthiest years in which there is most wind."

With respect to the comparative frequency of diseases at different seasons of the year, I find several important allusions in the " Sylva Sylvarum "; I need only quote one :   " It is commonly seen that more are sick in the summer and more die in the winter ; except it be pestilent diseases, which commonly reign in summer and autumn.   The reason is, because diseases are bred chiefly by heat ; but then they are cured most by sweat and purge, which in the summer is provoked more easily.   .   .   .   The general opinion is, that years hot and moist are most pestilent, upon the superficial ground that heat and moisture cause putrefaction."   He then speaks of tainted waters and how they are rendered less wholesome.

Bacon's allusions to the *general diseases* of the body are frequent, and although he refers to them from almost every standpoint, and displays his wisdom in many forms of expression, as we have already seen, I will select only a few words which exhibit him in a somewhat lighter vein, but not the less pertinent and interesting.   In his "Apophthegms" he writes : " In sickness there are three things that are material ; the physician, the disease, and the patient.   If any of these join then they have the victory.   If the physician and the patient join, then down goes the disease.   If the physician and the disease join, then down goes the patient.   If the patient and the disease join, then down goes the physician ; for he is discredited."   In the same treatise he wittily relates an experience, not too complimentary to the profession, which is worth quoting : " There was a gentleman fell very sick, and a friend of his said to him, ' Surely you are in danger, I pray send for a physician.' But the sick man answered, ' It is no matter, for if I die, I will die at leisure.' "

It may not be out of place here to record an observation, which is found in his essay on " Empire," especially interesting on account of the reference to the circulation of the blood. Speaking of merchants in this essay, he adds, " they are the *Vena Porta*." This anatomical allusion occurs several times in Bacon's works, as in the " History of Henry VII," where he says : " Being a king that loved wealth and treasure he could not endure to have trade sick, nor any obstruction to continue in the gate-vein which disperseth that blood."

Mr. Ellis writes that " the metaphor is historically curious ; for no one would have used it since the discovery of the circulation of the blood and of the lacteals. But in Bacon's time it was supposed that the chyle was taken up by the veins which converge to the *vena porta*. Bacon's meaning is that commerce concentrates the resources of a country in order to their distribution."

We find Bacon referring to this view again in his " Track on Transmutations " to this effect : " The slime about the reins (that is, the kidneys) and bladder in man's body turns into stone, and stone is likewise found often in the gall, and sometimes, though rarely, in *vena porta !* "

With regard to *mental disease*, we shall find but few direct allusions in the works of Bacon. Turning to the " Advancement of Learning " we read : " It were too long to go over the particular remedies which learning doth minister to all the diseases of the mind, sometimes purging the ill-humours, sometimes opening the obstructions, sometimes helping the digestion, sometimes increasing appetite, sometimes the wounds and exculcubations thereof."

In his " Sylva Sylvarum " he refers specially to leprosy, hydrophobia, and various infectious diseases, and it is interesting to notice that he includes " consumptions of the lungs " among them, which, as he explains, " taint the breath and pass manifestly from man to man." In the same treatise he attempts to enumerate the channels through which infectious diseases are communicated from man to man. It is quite evident that during the reign of Henry VII there was an unusual epidemic of *plague*, or what was known in the fourteenth century as Black Death ; for in Bacon's admirable history of that reign he directs special attention to it in the following lines : " This fifteenth year of the King " (this would be 1499) " there was a great plague both in London and in divers parts of the Kingdom. Wherefore the King after often change of places, whether to avoid the danger of the sickness, or to give an interview with the Archduke, or both, sailed over with his Queen to Calais," &c.

F—13*a*

In the " Sylva Sylvarum " there is evidence of Bacon's acquaintance with early medical literature, and he also shows us that he had directed his inquiries with reference to the cure of malignant growths. "Galen," he says, "speaketh of the curing of the scirrus of the liver, by milk of a cow that feedeth upon certain herbs." In referring to Spedding's notes on this passage, I find he says : " Galen in several places speaks of the medicinal qualities which milk may derive from the herbs on which the cow fed, but I have not found the passage to which Bacon appears to refer." What Spedding has been unable to trace, possibly some of you have already noticed. In the " Sylva " you will also find references to various involuntary acts and other phenomena such as yawning, hiccough, sneezing, sighing, groaning, screaming, grinding of the teeth, blushing, laughing. He also attempts to describe the modes of operation and effects of the passions of the mind : likewise drunkenness, lassitude, &c. In this book he also makes special reference to the *teeth* and sums the matter up thus : " Concerning the teeth these things are to be considered : (1) The preserving of them, (2) the keeping of them white, (3) the drawing of them with least pain, (4) the staying and easing of the toothache, (5) the binding in of artificial teeth, (6) restoring teeth in age." Besides these there are many short references to " Diseases : their Management and Treatment," throughout his books ; for instance : " Wounds cannot be cured without searching." . . . " As for the just cure, it must answer to the particular disease, and so be left to counsel rather than rule "—both remarks being taken from the Essays.

The consequences of malpractices in the surgeon are referred to in Bacon's " Maxims of the Law." I need only quote one passage from this : " If a surgeon authorized to practise do, through negligence in his cure, cause the party to die, the surgeon shall not be brought in question of his life ; and yet, if he do only hurt the wound, whereby the cure is cast back and death ensues not, he is subject to an action upon the case for his misfeasance." I hope we may presume that the meaning of this was to consider the liability where there was *intention* to " hurt the wound," else the surgeon must have been frequently condemned.

Bacon was well aware of the possibility of establishing a *toleration* with regard to certain poisons, and also had a fairly clear conception of what we now understand by the term " *immunity.*" I must refer you to a passage in the " Sylva Sylvarum " illustrative of this. He says : " There is a secret way of cure (unpractised) by assuetude of that which in itself hurteth. Poisons have been made by some, familiar

as hath been said." He refers to the case of Mithridates and the attempt made to poison Alexander. "Ordinary keepers of the sick of the plague are seldom infected. Enduring of tortures by custom, hath been made more easy. . . . Generally, diseases that are chronical, as coughs, phthisis, some kinds of palsies, lunacies, &c., are more dangerous at the first. Therefore a wise physician will consider whether a disease be incurable, or whether the first cure of it be not full of peril; and if he find it to be such, let him resort to palliation, and alleviate the symptom without busying himself too much with the perfect cure; and many times (if the patient be indeed patient) that course will exceed all expectation. Likewise the patient himself may strive by little and little to overcome the symptom in the exacerbation, and so by time, turn suffering into Nature."

MEDICINES AND SPECIAL MEDICAL APPLICATIONS.

Method was Bacon's watchword. In every department this keen appreciation of detail and careful arrangement of facts are evident. Alluding to "Medicining of the body" in the "Advancement of Learning," he says: "It is in order first to know the divers complexions and constitutions; secondly, the diseases, and lastly, the cures." Among his numerous experiments, chemical and otherwise, he made a special study of what he termed "commixture of liquors," and in his tract on "Transmutations," he states his conclusions. To give an idea as to the nature of such experiments I may quote a few lines from this work: "Dissolution of gold and oil of vitriol commixed, a dram of each, gathereth a great heat at the first, and darkeneth the gold and maketh a thick yellow. . . . Oil of vitriol and dissolution of quicksilver, a dram of each, maketh an extreme strife and casteth up a very gross fume, and after, casteth down a white kind of curds and on the top a slimish substance, and gathereth a great heat. . . . One ounce of blood and one ounce of milk do easily incorporate." Then, again, in the "Physiological Remains" other experimental results are published. Under *calcination* he says: "All metals may be calcined by strong waters, or by admixture of salt, mercury and sulphur. The imperfect metals may be calcined by continuance of simple fire; iron thus calcined is called Crocus Martis. Gold and silver are best calcined by mercury. Their colour is grey. Lead calcined is very red. Copper dusky red. Metals are *sublimid* by joining them with mercury or salts. As silver with mercury, gold with sal ammoniac, mercury with vitriol." He continues this discourse by

referring to precipitation, amalgamation, vitrification, and dissolution. Under the last head he says : " All metals without exception may be dissolved," and he then proceeds to enumerate a large number of experiments in a variety of metals and the solutions necessary to dissolve them.   In this connexion, too, he speaks of reduction and volatility.

Bacon thoroughly grasped the manner of applying medical remedies, according to the tenets of his own day, and very often his advice, whether given directly or by quaint metaphor, was in advance of contemporary professional opinion.   In his " History of Henry VII," speaking of the attitude of Perkin Warbeck in trusting more to his friends within the realm than to foreign arms, we read : " It behoved him to apply the remedy where the disease lay, and to proceed with severity against some of the principal conspirators here within the realm.   .   . The Lord Chamberlain was not touched, whether it were that the King would not stir too many humours at once, but after the manner of good physicians purge the head last."   In the same history his reference to *bleeding* is in the same vein : " The King commonly drew blood as physicians do rather to save life than to spill it, and was never cruel when he was severe."   You will find a reference to *cupping* in the " Novum Organum," under what Bacon terms the " Motion of Connexion," whereby, as he says, " bodies do not allow themselves to be separated at any point from contact with another body."   " This is called by the schools a motion to prevent a vacuum.   It takes place when water is drawn up by suction or a syringe, the ' Flesh by Cupping.' " He also describes here the solubility of bodies under the term " Motion of Acquisition," or the " Motion of Need," and he explains in a very interesting manner how various substances may be selected or acquired by liquids and air.

From a passage which occurs in the " Sylva Sylvarum " it is evident that Bacon conceived the idea and therapeutic value of *massage ;* for, referring to the nourishment of emaciated bodies, he observes that " gentle frication draweth forth the nourishment by making the parts a little hungry and heating them, whereby they call forth nourishment the better.   This frication I wish to be done in the morning.   It is also best done by the hand, or a piece of scarlet wool, wet a little with oil of almonds, mingled with a small quantity•of bay-salt or saffron.   We see that the very currying of horses doth make them fat and in good liking." And he says again, " Some outward emolients make the parts more apt to assimilate."

In recalling the actions of different medicines, &c., we find much observation and discrimination ; for instance, where he suggests " The

point of the first and the last should be observed in all natural actions: thus in an infusion of rhubarb, the purgative property is first extracted and then the astringent. We have experienced something of the same kind in steeping violets in vinegar, which first extracts the sweet and delicate odour of the flower, and then the more earthy part, which disturbs the perfume."

Again, in the " Sylva Sylvarum " we read : " Rhubarb hath manifestly in it parts of contrary operations : parts that purge, and parts that bind the body : and the first lie lower, and the latter lie deeper : so that if you infuse rhubarb for an hour and crush it well, it will purge better, and bind the body less after the purging, than if it stood twenty-four hours. But I conceive likewise that by repeating the infusion of rhubarb several times, letting each stay in but a little time, you will make it as strong a purging medicine as scammony. And it is not a small thing in physic if you can make rhubarb and other medicines that are benedict, as strong purgers as those that are not without some malignity." He discusses purgation generally and the manner of operation of various remedies in this class, for the details of which I must refer you to the " Sylva Sylvarum."

Under this head allow me to quote a few lines from his essay on " Friendship." "A principal fruit of friendship is the ease and discharge of the fulness and swellings of the heart, which passions of all kinds do cause and induce. We know diseases of stoppings and suffocations are the most dangerous in the body, and it is not much otherwise in the mind : you may take sarza to open the liver, steel to open the spleen, flowers of sulphur for the lungs, castoreum for the brain ; but no receipt openeth the heart, but a true friend to whom you may impart griefs, joys, fears, hopes, suspicions, &c."

He seems to have made a very careful study of the action of various *opiates*. In the "Novum Organum," for instance, he endeavours to explain how they expel the "spirits contained in the ventricles of the brain, but in smaller doses, and in moderation by a secondary action, strengthen the spirits, rendering them more robust, and thus contribute not a little to the cure of diseases and the prolongation of life." Again, in a reference to *opium* itself, he says : " The Greeks imputed much to opium, both for health and prolongation of life, but the Arabs still more, so that their higher medicines (which they call ' God's Hands ') have opium for their basis and principal ingredient, with a mixture of other things to correct the noxious crudities thereof, such as treacle, mithridate and the like." *Tobacco*, he says, " has immensely increased of late. It tends, no doubt, to relieve the body and remove weariness. It is a

kind of henbane, and manifestly affects the head, as all opiates do."
" Simple opiates are called narcotics "—and in this class he mentions
seed of the poppy, henbane, tobacco, and nightshade.   Tenison, in his
" Baconiana," collected a number of Bacon's " Medical Receipts."
These compounds, which were intended to relieve various affections,
included elder, marigold, thyme, cream of tartar, mallows, camomile, &c.,
but for the details of this study I must refer you to the work itself.

Without reciting all the mixtures and remedies which Bacon
suggests, it may be interesting to notice what he himself found useful
in *gout*, and he details this information in the " Sylva Sylvarum " as
follows : " There be many medicines, which by themselves would do
no cure, but perhaps hurt ; but being applied in a certain order, one
after another, do great cures.   I have tried (myself) a remedy for the
gout, which hath seldom failed, but driven it away in twenty-four hours'
space ; it is first to apply a poultice, of which *vide* the receipt ; and then
a bath or fomentation, of which *vide* the receipt ; and then a plaister,
vide the receipt."   These receipts are not found in the original issue of
the work, but were inserted on a separate leaf at the end of the second
edition in 1635.   In order they are : (1) The *poultice :* " Of manchet
about 3 oz., the crumb only, thin cut.   Let it be boiled in milk till it
grow a pulp.   Add in the end a dram and a half of the powder of red
roses.   Of saffron ten grains.   Of oil of roses an ounce.   Let it be spread
upon a linen cloth and applied luke-warm, and continued for three hours'
space."   (2) The *fomentation :* " Of sage-leaves half an handful.   Of
the root of hemlock sliced 6 drams.   Of briony roots half an ounce.   Of
the leaves of red roses two pugils.   Let them be boiled in a pottle of
water, wherein steel hath been quenched, till the liquor come to a quart.
After the straining, put in half an handful of bay-salt.   Let it be used
with scarlet cloth or wool, dipped in liquor hot, and so renewed seven
times ;   all in the space of a quarter of an hour, or a little more."
(3) The *plaister :* " Emplastorum diacalciteos, as much as is sufficient for
the part you mean to cover.   Let it be dissolved with oil of roses, in
such a consistence as will stick, and spread upon a piece of holland and
applied."   After this he continues to explain how each application acts
and the precautions that are necessary.

In his treatise on " The Wisdom of the Ancients " he plainly shows
us that the phenomenon of *radiant energy* has not escaped him.   Take
the following passage : " The body of Nature is most elegantly and truly
represented as covered with hair : in allusion to the rays which all
objects emit ; for the rays are like the hairs and bristles of Nature ; and
there is scarcely anything which is not more or less radiant.   This is

very plainly seen in the power of vision, and not less so in all kinds of magnetic virtue, and in every effort which takes place at a distance. For whatever produces an effect at a distance may be truly said to emit rays."

THE SPECIAL SENSES.

As illustrating Bacon's views respecting *taste* and *smell* and their relation to each other, an interesting passage occurs in the "Novum Organum," which runs as follows: "Those who do not smell, but are deprived by Nature of that sense, do not perceive or distinguish rancid or putrid food by their taste. Again, those whose nostrils are obstructed by accident (such as cold) do not distinguish any putrid or rancid matter from anything sprinkled with rose water. If those who suffer from cold blow their noses violently at the very moment in which they have anything fetid or perfumed in their mouth, or on their palate, they instantly have a clear perception of the fetor or perfume. These instances offer and constitute this species or division of taste; namely, that it is in fact nothing else than an internal smelling, passing and descending through the upper passages of the nostrils to the mouth and palate. But on the other hand, those whose power of smelling is deficient, or obstructed, perceive what is salt, sweet, pungent, acid, rough and bitter, as well as anyone else. So that the taste is clearly something compounded of the internal smelling, and an exquisite species of touch, which we will not here discuss." Later, under the same thesis, he discusses *sensation*, comparing this in the animated body with the "motions" in the inanimate. To show the manner in which he approaches this portion of the subject, I may quote a sentence or two. "There must be many more motions in the inanimate bodies than senses in the animated, from the small numbers of organs of sense. A very plain example of this is afforded by pains. For, as animals are liable to many kinds and various descriptions of pains (such as that of burning, of intense cold, of pricking, squeezing, stretching and the like), so it is most certain that the same circumstances, as far as motion is concerned, happen to inanimate bodies, such as wood, stone when burnt, frozen, pricked, cut or bruised, though there be no sensation owing to the absence of animal spirit."

The subjects of *sight and touch* are also considered in the "Novum Organum," and those who wish to understand Bacon's method and treatment of the special senses will be interested and repaid by a perusal of that portion of the work which deals with them. Before leaving this part of our subject, however, there are some references he makes as to

sight, and as they include his observations with regard to the use of the *microscope,* it may be interesting specially to note them. He says: "It is obvious that sight holds the first rank among the senses, with regard to information, for which reason we must seek principally helps for that sense. These appear to be threefold: either to enable it to perceive objects not naturally seen; or to see them from a greater distance; or to see them more accurately and distinctly. We have an example of the first (not to speak of spectacles, and the like, which only correct and remove the infirmity of a deficient sight, and therefore give no further information) in the lately invented microscopes, which exhibit the latent and invisible minutiæ of substances and their hidden formation and motion, by wonderfully increasing their apparent magnitude. By this assistance we behold with astonishment the accurate form and outline of a flea, moss, and animalculæ, as well as their previously invisible 'colour and motion.'" Under the same subject a little later he remarks: "Men have (as is usual in new and wonderful discoveries) added a superstitious remark, that the microscope sheds a lustre on the works of Nature, and dishonour on those of art; which only means that the tissue of Nature is much more delicate than that of art. For the microscope is only of use for minute objects, and Democritus, perhaps if he had seen it, would have exulted in the thought of a means being discovered for seeing his atom, which he affirmed to be entirely invisible." Then, as showing the limitations of these early microscopes, let us notice another word which he adds: "But the inadequacy of these microscopes for the observation of any but the most minute bodies destroys their utility. For if the invention could be extended to greater bodies, so that the latent minutiæ and irregularities of liquids, urine, blood, wounds, and many other things be rendered visible, the greatest advantage would without doubt be derived." These words have a special interest; for they plainly show not only that Bacon conceived greater possibilities for the microscope, but also that he was capable of suggesting the lines on which scientific observation should be conducted.

GENERATION, DECAY AND DEATH.

In his ceaseless investigations of the phenomena of Nature, both in plants and animals, Bacon frequently turned his attention to such physical conditions as heat, cold, putrefaction, &c. In one place we find him expressing himself thus: "All putrefaction exhibits some slight degree of heat, though not enough to be perceptible by the touch."

"Animals become warm by motion and exercise, wine and feasting, venery, burning fevers, and grief. In the paroxysm of intermittent fevers the patients are at first seized with cold and shivering, but soon afterwards become more heated than at first; in burning and pestilential fevers they are hot from the beginning." And he continues by a comparative study of the heat of man and that of the lower animals. In another place he adds: "With regard to heat, man possesses abundant means and power; but his observation and inquiry are defective in some respects, and those of the greatest importance, notwithstanding the boasting of quacks." Questions on the regulation of plants and the organization of animals had a special fascination for him. We find him expressing himself thus: "If we would observe the hatching of eggs, we would easily see the process of animation and organization, and what parts are formed of the yolk and what of the white of the egg." He adds: "The same may be said of the inquiry into the formation of animals from putrefaction; for it would not be so humane to inquire into perfect and terrestrial animals, by cutting the fœtus from the womb; but opportunities may perhaps be offered of abortions, animals killed in hunting, and the like. . . . Contemplations of this kind may be considered as carried on by night, from the minuteness and perpetual "burning of our Watch-light." In another place he refers to Telesius attributing the formation of animals to the "Channels and folds of the womb," and Bacon adds that he ought to have observed a similar formation in the young in eggs, "which have no wrinkles or irregularities." One is impressed by the keen observation displayed by Bacon in such matters, and by the important suggestions which he offers. Nor is he ignorant of the experiences of those who preceded him in experimental research.

In the "Sylva Sylvarum" Bacon devotes a section to explaining the cause of gangrene and "mortification by cold," and he suggests the necessary precautions and treatment indicated. One may fairly say that the advice he gives is rational and in accord with present-day usage, more especially as it refers to the treatment of gangrene due to intense cold and frost prevalent in some climates.

In his essay of "Death" he says: "Many times death passeth with less pain than the torture of a limb, for the most vital parts are not the quickest of sense." Then he quotes from Seneca: "Pompa mortis magis terret, quam mors ipsa" (It is the accompaniments of death that are frightful rather than death itself). It is worthy of observing that there is no passion in the mind of man so weak that it mates and masters the fear of death. Revenge triumphs over death; Love slights it; Honour

despiseth it; Grief flieth to it; Fear preoccupieth it. . . . It is as natural to die as to be born, and to a little infant, perhaps, the one is as painful as the other. He that dies in an earnest pursuit is like one that is wounded in hot blood ; who for the time scarce feels the hurt, and therefore a mind fixed and bent upon somewhat that is good doth avert the dolours of death." In his beautiful memoir of Queen Elizabeth, entitled " In Felicem Memoriam Elizabethæ," he thus describes her last illness : " For a few days before her death, by reason of the exceeding dryness of her body, wasted as it was by the cares of government, and never refreshed with wine or a more generous diet, she was struck with paralysis ; and yet she retained her powers of speech (a thing not usual in that disease) and of mind and of motion ; only somewhat slower and duller. And this state of body lasted a few days, as if it were less like the last act of life than the first step to death. For to continue long alive with the faculties impaired is a miserable thing ; but to have the sense a little laid asleep, and so pass quickly to death, is a placid and merciful period and close of life."

In his memorial of Henry Prince of Wales, we find these concluding remarks with reference to his death : " He died in the nineteenth year of his age of a malignant fever, which — springing from the great heats and droughts, greater than islanders are accustomed to—was very general among the people during the summer, though few died of it ; but became towards the autumn more fatal. Rumour, even more malignant (as Tacitus says) upon the death of princes, suggested poison. But as no symptoms of such a thing appeared, especially in the stomach, which is commonly most affected by poison, that report soon died away."

One may add here, that in Bacon's own death we have, as it were, the very reflection of what lay nearest his heart—viz., the advancement of scientific methods of research ; for you will remember that it was the result of an experiment to prove the preservative action of intense cold on animal bodies.

In the limited time at our disposal it is obvious that only a hasty résumé of Bacon's medical allusions is possible, and indeed, to include fully all such references would constitute a volume of considerable dimensions. Though his works are available to all, I trust the indications I have given may assist those who are wishful to undertake a more extended review.

I think we may conclude that a consideration of his observations may be useful in assisting us to estimate the standing and accomplishments of the medical men of his period, and they may also possibly enhance our admiration for one of our greatest Englishmen.

Section of the History of Medicine.

March 5, 1913.

Sir Wm. Osler, Bt., F.R.S., President of the Section, in the Chair.

A New Egyptian Medical Papyrus.

By Joseph Offord.

Some few years ago an expedition of United States explorers under the conduct of Dr. Reissner was excavating in Egypt, with funds provided by Mrs. Sophie B. Hearst, on behalf of the University of California. The debris from the trenches, or tunnels, into the mounds was of value to the fellahin as a fertilizer for their fields, and permission was given them to take what they wished of it. Because of this gift to him of " sebakh " one of the peasants presented to the party a papyrus he had found when digging for the same material some years previously. Upon unrolling the manuscript it was found to be almost complete, and gave some eighteen columns of fairly legible hieratic writing. This, for an Egyptian papyrus, comparatively long text, contained a medical work similar in character, as will be seen, to the famous Berlin and Ebers papyri. For paleographic reasons it may be assigned to about the same age as the Ebers manuscript, that is to say, at a time previous to the reign of Amenophis I, somewhere between the twelfth and eighteenth dynasties.[1] The writing is all in black ink with the exception of the prescription headings, and some quantity figures for ingredients, which are in red.

The "Hearst Papyrus," as it will henceforth be entitled, whilst presenting to us a compendium of remedies for diseases, the majority of which, allowing for minor alterations, are almost identical with those

[1] 2400—1600 b.c.

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of the Ebers papyrus, is not a copy of the same treatise. A careful comparison soon indicates that each work contains matter not present in the other. But they are so far alike that Dr. Reissner has not, at present, published the Hearst Papyrus in extenso in translation, but has been content to give photographic facsimiles of the text, and to indicate the parallelism between it and the Ebers manuscript. He also edits in full the magical incantations which are new to us, and adds a glossary of words found in this fresh text.

The close connexion between the Hearst and Ebers treatises is the most important fact concerning them, for not only are many prescriptions the same in each, but they are arranged in groups much alike in their contents concerning certain parts of the body, or of allied maladies, and these are similarly grouped in both texts, thus conclusively proving some common origin for them. These groups, however, though almost identical in their own arrangement, do not appear in quite the same order of position in the two manuscripts. Sometimes also prescriptions in the Hearst text, identical with those in the Ebers, are inserted under a different heading. Occasionally also the same headings in the two works are followed by varying ingredients for cure. All the differences however are small compared with the similarities, and that the two documents are based upon a common source, or sources, is proved because both papyri give duplicate copies of the same paragraphs for certain remedies. This interesting fact indicates the true nature of both works as we now have them ; they are copies in full, or extracts from previous collections of medical and magical formulæ. Hence if two, or more, of these earlier lists contained the same remedies, they became embodied in these two compendiums more than once. This view of the origin of the Ebers text was that of Professor Ebers himself and is now confirmed by the recovery of the Hearst variant work. The Ebers scribe vaunted that some of his prescriptions were derived from books stored in special temples, or from works of certain physicians. The Hearst writer makes no such claim for his collection. His text does, as does the Ebers, assert that several of its remedies were of divine origin, chiefly those concerned with the urinary organs. One of these was advised by the deity SHU for himself, another was made by TEFNUT for the healing of RA. This god also had been benefited by cures concocted by NUT and ISIS. One special one is given by the latter, as beneficial for the head. Another cure of a disease not yet identified is said, by the Ebers writer, to have been given him by a Semitic man of Khephren, and it is repeated in the Hearst series.

The possession of the two manuscripts with their differences and divergencies probably decides the question as to whether they may be considered to represent one of the great hermetical medical compendiums that Clement of Alexandria tells us were kept in the larger temple libraries. He says that out of the thirty-six books, or rather encyclopædias, of various subjects guarded there, " six treated of medicine "—that is to say, of the " structure " of the body and of its maladies ; of the " organs " and their remedies, of the eyes, and of the female organs.

The character of these two recently found works, and also of the other Egyptian medical papyri we yet possess, however, contradicts our accepting them as a specimen of the hermetic temple books ; unless the sacred scribes worked very carelessly, which is unlikely. As mentioned, some of the formulæ appear twice over ; many of the groups of recipes, and chapters too, are differently arranged. Had their archetype text emanated from a sacred library, or been copied by sacred scribes, all their dissimilarities would have been done away with. Moreover, could the scribe of either of them have asserted that the work was a divine hermetic temple certificated work, no attempt to augment the authority of individual remedies by ascription of them to specified deities need have been made. The whole would have been divine, and so amply authenticated.

Neither of the two papyri claim that their contents as a whole were inspired, nor were their scribes when writing them evidently working as embued with such an idea. The reference in Ebers to the God THOTH does not claim his authorship for the collection, but merely states he was the deity of medicine, or of medical men. Hence the divergencies in both the matter itself and the order of its engrossment ; each scribe just wrote as suited his convenience, or copied the text of a previous scribe who had done so. Or, if each of them compiled his work for himself from several series of shorter formulæ, he arranged them as suited him best, or as they happened to be before him.

By the time of Clement the contents of these two works may have been, with better arrangement, absorbed into one of the temple-kept medical works. It would appear then, that at the time when these two manuscripts were written, the recorded medical knowledge of Egypt consisted of compilations of a number of collections of prescriptions. In one sense perhaps sacred, from having been made up from the formulæ of physicians practising at curative shrines. At these sites, in earlier times, they had probably been bequeathed verbally from

generation to generation, as empirical lore relating to aphrodisiacs is still handed down by Kaffir and Negro "medicine men" at the present day. Some of the chapters, however, may merely be the recipes of an ordinary, that is to say, not a sacerdotal physician, and the collection thus comprises the notes of a practitioner, and also the, in some cases, cures acquired from abroad by travellers.

The Hearst papyrus came from a ruined house in a small provincial town, and so was probably an inexpensive copy (for the text says that it was copied) of the then common medical treatise possessed by a country doctor. It is less carefully compiled than the Ebers papyrus, but then that was found at the great Metropolis of Thebes, and perhaps was a more costly production, and though only a rough book of reference was for a wealthier owner. As we have said, neither of them were very perfectly produced, but that does not prove that contemporary with them better editions may not have been, rarely, in existence. But it does tend to show, although one was alleged to have been found in a temple, that they are not copies of a work treasured there, and both the Berlin and Hearst manuscripts are apparently cheap ones for a doctor's daily use.

It is curious that whilst indications separating the work into chapters are provided in Ebers, only one chapter, numbered as the eighth, is specified in Hearst. Guided by the first papyrus, Dr. Reissner has attempted separating the second into chapters, as far as possible parallel to those in Ebers. The traces of a plan to group together in batches remedies for some special bodily members, or parts, such as the eyes, female organs, head, and hair, skin, and urinary organs, is quite apparent in both works. But in the Hearst text, what may be termed specific and infectious diseases are put together in what Dr. Reissner labels Chapter XII. Nearly all the ailments of this section are yet unidentified. One of them is a so-called Semitic disease.

The chief novelties in the Hearst manuscript are prescriptions relating to diseases of the fingers and toes, also three methods for "uniting a bone" upon the first day ; and some for curing the bites of animals. The question naturally arises, Does the new papyrus show any further possession of true medical knowledge than do those previously known? and the answer is decidedly in the negative. Indeed the scribe appears to have depended more upon the magic arts for cure, as there is a greater proportion of incantations in this work than in the others. Still no idea of even the fact of contagion is apparent in any ancient Egyptian medical book. All pains, aches, and symptoms were

caused by the gods, or evil spirits, and subject to cure by divine assistance. So all remedies had to be prepared with due recitals of the proper form of words, and when applied, assisted again by verbal charms; even the weighing or measuring of the ingredients must be made potent in the same fashion, and the Hearst papyrus gives us the protective talismanic sentences proper to recite when taking out for use the liquid measure called "dbh." Another verbal charm is that "to accompany any healing" draught, "a third" for "appliance with any bandage"; whilst one of apparently universal utility was "for any remedy." Whilst magic was thus allied with medicine as curative, vice versa, medicine might counteract the effects of malicious magic; for a disease so imposed could be eliminated by a recipe composed of soda, dates, hair, fruit, incense, and beer, well mixed and imbibed.

From these triple—Berlin, Ebers, and Hearst—papyri, supplemented by others less complete, we see that the diagnosis of early Egyptian physicians was very primitive indeed, and only guided by the region and extent of the pain and general appearance. Cures were effected by combined enchantments and prescriptions, the latter, as far as we can yet detect, not founded upon any real scientific knowledge of the cause of the suffering, or decay, nor by much pharmaceutical wisdom; the duplicate means of cure were, apparently, deemed to be equally efficacious. But though the medicine's potency was thought to be meagre, minus the magic, by the multitude, yet the priestly physicians may have, among themselves, valued the latter merely as an assistant, by means of auto-suggestion, in the patient's recovery. At all events the curative ingredients, unless positively injurious, plus the incantations, were more likely to succeed than the so-called "Christian Science" without the medical art, of to-day. Perhaps too if the physician did not possess the secret successful magic formulæ, and use them, the fees would have been less freely forthcoming.

It is to be regretted that the Hearst text is to such a considerable extent duplicate of the Ebers papyrus, but it shows us that as remedies and enchantments obtained a celebrity as having been effective, they were recorded in books. Firstly in small lists of such matters; and then these were collected together into larger summaries, such as the three papyri we have considered. We have then in these manuscripts probably the cures advised by several medical men for their patients for various common diseases.

The Hearst papyrus has not met, at present, with the notice it deserves, but it will now be preferable to postpone a complete edition of

the medical papyri until the one written in Coptic, in possession of the French Archæological School at Cairo, is published by its editor, M. Chassinat.

The curious nature of the old recipes is compared by Dr. Reissner with those used to-day among the ignorant fellahin ; to these should now be added a list just published by Captain Stanley, R.A.M.C., in his report upon the Oasis of Siwa.

Restrictions concerning Circumcision under the Romans.

By Joseph Offord.

STUDENTS of medical matters in Roman times are familiar with the rescript of the Emperor Antoninus concerning the acts of circumcision and castration so prevalent at his period.[1]   Much further light has now been thrown upon the administration of his law by a number of papyri recently discovered in Egypt.   That country was a province where the edict was especially provocative, because not only its Jewish inhabitants but all the numerous priestly families who were worshippers of the ancient deities had practised the rite of circumcision from time immemorial.

The decision of Antoninus to restrict the practice as far as good statesmanship rendered possible, was not the first imperial effort of the kind, because Hadrian, at least, had endeavoured to stop all such mutilations.   In his time, the luxury of having eunuchs, a system *de ménage* imported by Romans from the East, had become so frequent, that it threatened to diminish the population, and so he made the act of castration a capital crime.   He also attempted to prohibit circumcision, because of the Jewish propaganda of the rite, to which his Hebrew subjects, after the dispersion under Titus, attached great importance, making it indispensable for converts, and imposing it upon their slaves. Many Romans were tempted to become Jews, owing to the numerous privileges that people still possessed, but what was Hadrian's chief

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[1] (*a*) Circumcidere Judaeis filios suos tantum rescripto Divi Pii permittitur, in non ejusdem religionis qui hoc fecerint castrantes poena irrogatur (Digest 48). (*b*) Cives Romani qui se Judaico ritu vel servos suos circumcidere patiuntur bonis ademptis in insulam perpetuo relegantur.   Medici capita puniuntur Judaei, si alienae nationis comparatos servos circumciderint, aut deportantur, aut capite puniuntur (Pauli Sententiae, v, xxii).

Relief from the sixth dynasty Egyptian tomb of Ankh-Ma-Hor, at Sakkara; about 3000 B.C.; showing operation of circumcision. (From a photograph kindly lent by Dr. F. M. Sandwith.)

objection, except to its reducing the number of nominal Roman citizens, is not quite clear.[1] He held to his point, however, and Spartianus suggests it was the cause of the great Jewish rebellion of his reign.

Antoninus's rescript was more reasonable and practical politically. The Jewish religion being legally licensed, Jews were, by it, allowed to circumcise their offspring, but not their non-Hebrew slaves; such a deed was assimilated to castration, and the punishment was death for " humiliores " : relegation for " honestiores." Romans might adopt the Jews' religion, but must neither circumcise themselves nor their slaves.[2] Confiscation of their wealth and banishment to an island were the penalties. Further, any medical man performing the operation was executed. This law of Antoninus has hitherto been thought to have been specially, if not entirely, anti-Jewish, but this was not so, and it is from this point of view that the evidence of the new papyri becomes so valuable.

The rescript applied to all peoples and countries in the Empire, but more particularly to Egypt, because of the frequency of circumcision therein. The number of papyri connected with this law already edited is a proof of this, there being three known at Geneva, one at Strasburg, two at Berlin, and two in the Tebtunis collection. These documents date from A.D. 155 to 189, showing that the rescript, the definite date of which is not known, was promulgated before 155, and remained in force at least until Commodus.

In ancient Egypt, circumcision was obligatory for the priesthood, but merely permissible for the laity. The Roman rescript prohibited it for the laity and for all but genuine Egyptian priests and Jews, the Emperor wisely not wishing to offend either the powerful priestly hierarchy or the influential Jewish community. But the operation was to be, as far as possible, restricted, and to achieve this the papyri prove that the permit was solely vested in the power of the official high priest, a sort of minister of worship who was not an Egyptian, but a Roman bureaucrat who, though residing at Alexandria, yet had authority over every Egyptian temple.

The manner of securing obedience to the rescript in Egypt is clearly disclosed by the papyri, showing that, instead of the decision of permit to circumcise being left to each temple for its hierophant's ruling, only

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[1] " Codex Justiniarius," forbade the practice to Roman citizens who had become Jewish converts.

[2] Flavius Clemens, nephew of Titus and Domitian, who, with Domitilla, became Jews, suffered death, Gratz states, because he was circumcised. See *Gesch.*, iv, pp. 403-70.

the high priest could grant permission. Thus the whole matter was securely swept into the Roman executive net. To reduce the number of applications, a series of necessary formalities was devised, and these the papyri explain. First a written request, βισλίδιον, had to be forwarded to the (nome) county magistrate, or to the strategus, or their *locum tenens ad interim*. Thus a Tebtunis papyrus of A.D. 189 concerns a priestess, Isidora, wife of a priest, and preserves her appeal to the strategus of the Arsinoite nome, and omitting unimportant words runs thus :—

"Wishing to circumcise my son Pakekbis, son of Cronion, and grandson of Harpocration, a priest exempt from tribute; intended to succeed to the office of prophet in the temple; and also Paneses, son of my deceased maternal uncle. I pray you, as usual, to write to the great high priest in order to obtain authorization to circumcise these two children and accomplish the appropriate holy ceremonies. This current year the children have : Pakekbis, seven years; Paneses, eleven years. My husband, the aforesaid Cronion, is absent at Alexandria, will bring them before his highness the high priest."

The request should have emitted from the children's father, but, if it were impossible, from another near member of the family. Isidora thus presented both, because her husband was away, and the other youth's father was deceased.

The main proofs presented to achieve permit were those of sacerdotal familyship. The most suitable documents for this purpose were the census returns, wherein were inscribed every person's name, affiliation, and status. Secondly, the attestation by a number of priests at the same shrine, or in the same county. They had their own temple archives setting forth the parentage and the name of one of the five temple tribes, of which the candidate had to be a member. The papyri prove that under Antoninus these statements as to status might be made verbally, but by the time of Commodus an inscribed and sworn testimony was necessary.

It is a curious fact that application to circumcise one of these lads, Panesis, appears to have been made one or two years earlier, and not granted, because the annexed text from the second Tebtunis papyrus contains the certificate of four temple dignitaries requesting to obtain the permit to circumcise the boy, and shows that at the date of this document his father Marepsemis was still living; it is given as a specimen of such records:—

"From Cronion, son of Pakekbis, son of Harpocration, deputy

prophet, and from Maron, son of Cronion, son of Harpocration, and Maron, son of Maron, son of Marepsemis, and Pakekbis, son of Cronion, son of Psoiphis, the three last being priests, all four from the famous exempted temple of the village Tebtunis. With regard to the application presented to you by Marepsemis, son of Marsisuchus, son of Harpocration, priest of the said temple, requesting that his son Panesis by Thenpakekbis, daughter of Panesis, should be circumcised, in reply to your inquiry whether he is of a priestly family and ought to be circumcised, we declare on oath by the fortune of Marcus Aurelius Commodus Antoninus Augustus that he is in truth of priestly family, and that the proofs submitted by him are genuine, and that he ought to be circumcised, because he cannot perform the sacred offices unless this is done; otherwise may we be liable to the consequences of the oath."

The augmented legal formalities had for object to diminish the applications, for it was not necessary for all members of priestly families to be circumcised, but only those actually engaged in the cult of the gods. Many members were merely outdoor or inferior employees of temples, such as shepherds, gardeners, cultivators, builders, decorators, and mummifiers. It was only for ritual priests who personally approached the Deity that the Romans granted the rite. They could refuse it to the others without exciting religious fanaticism, and aptly did so.

The setting forth of the child's age in the papyri proves that there was a legal age limit, and they refer to such various ages as 1, 2, 5, 8, 7, and 11 years, indicating that for circumcising any age preceding puberty was permissible. Ambrose and Philo say the age for the operation was 13 and 14 years—evidently an error.[1] If the local inquiry was satisfactory, the strategus forwarded a summary of the proofs to the high priest. In papyri at Geneva and Strasburg we now possess such summaries.

Finally, the applicant had to present himself with the child at Alexandria, a great expense to residents in Upper Egypt. An indulgence on this point appears to have sometimes been granted, for a letter runs thus on the subject :—

" You are not ignorant of the anxiety I had in arranging the circumcision affair, but thanks to the valuable help of friends, we have managed it."

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[1] They may have meant for Jewish youths only.

At Alexandria the high priest recited the report in favour, and then examined the boys to see if any of their bodies bore any blemish (σημεῖα), corporal perfection being most important. He could not decide in doubtful cases such a theological matter, and so if he saw minor marks, a jury of priests, or the ἱερογραμματεις, attached to his office examined the candidate.

A Geneva papyrus records a curious case: one boy had no σεμεῖα, but some cicatrices (οὐλάς); and there does not seem to have been a precedent for such a case in the sacred books. The papyrus passage preserving the decision is much mutilated, but the investigation seems to have been adjourned to see if the blemishes disappeared.

A satisfactory application was notified by the high priest to the local strategus in this wise:—

"Year 22 of our lord Aurelius Commodus Antoninus Cæsar; 21 of Thoth. Pacusis, a priest, has presented his son Horus of the Heracleid district of the Arsinoite nome requesting permission to circumcise him. Seeing he has deposited the proofs with the nome secretary and written a letter on the subject, Julianus has inquired of the hierogrammats if the child bears any marks. They replied 'No.' I, Julianus, high priest of temples, having countersigned the letter, have ordered the child to be circumcised according to custom."

A copy of such a permit as this was given to the party concerned, and a duplicate one deposited in archives of the high priest at Alexandria.

Doubtless the Egyptian officials and scribes devised numerous technicalities and legal difficulties in the composing and verifying of documents, upon finding that their Roman superiors desired to diminish the number of circumcisions, and for the purpose of obtaining baksheesh from those applicants who secured permission in consequence of all the literary formalities having been duly provided for perusal.

Old English Herbals, 1525-1640.

By H. M. Barlow.

THE first herbal printed in England was a small quarto volume published anonymously by the London printer, Richard Banckes, in 1525. It is generally referred to as "Banckes' Herbal," and is the first of a series of small books, chiefly in black letter, without illustrations, which appeared during the next thirty years. This series may be distinguished from the larger and more important books with woodcut figures such as the "Grete Herball" and the herbals of Lyte and Gerard, which were based on works printed on the Continent. They came from the presses of various London printers, and were similar in size and external appearance. Some had titles closely resembling one another, and others carried the names of Macer and Askham, and the initials "W. C.," which have been supposed by bibliographers to represent the names Walter Cary and William Copland. Under all these names, therefore, these books may be found in various bibliographies such as Ames, Hazlitt, and others, and also in the printed catalogues of libraries and booksellers. Those having the appearance of anonymous works are generally grouped under the heading "Herbal."

It is somewhat strange that these quaint and interesting old volumes have not been bibliographically compared and described. In the history of the herbal they are thought to be of little or no importance, the attention of those interested in this fascinating literature being centred upon the series of larger works with woodcut illustrations. This is one reason why little consideration has been given to this series of books. Another reason is probably to be found in the obscurity concerning their authorship, the various writers to whom they have been ascribed, and whose names have already been quoted, having nothing whatever to do with the writing of them. It will be seen later that they are all various editions of the herbal printed by Banckes in 1525, but with trifling modifications, additions, or omissions. "Banckes' Herbal," on account of its numerous editions, enjoyed a popularity which was not shared by any other English herbal, even to a third of its degree. But this popularity depended, doubtless, on the price at which these editions were sold. Being small in size as well as in contents, and without illustrations, it would be very much cheaper than its rival folio work,

profusely illustrated with woodcuts, the "Grete Herball," which passed through four editions, the first in 1526, and the last in 1561.

Moreover, " Banckes' Herbal " is extremely rare. I have consulted the catalogues of many important libraries, but of the majority of the various editions I have been unable to trace more than a single copy. On the other hand, the larger English herbals of Turner, Gerard, and Parkinson, are frequently to be found, not only in British libraries, but also in the catalogues of second-hand booksellers. Pulteney, in his " Sketches of the Progress of Botany in England," 1790, the standard work of its time, only mentions three issues, one bearing the initials " W. C.," printed by Copland, the second the name of Macer, and the third that of Askham, whom he describes as the author. And his remarks clearly indicate that two of these were not actually examined by him, but only had their titles quoted, probably from Ames. Again, in 1854, Meyer's important work, " Geschichte der Botanik," which is still the standard book on its subject, only mentions the editions quoted by Pulteney. Of that bearing Askham's name, Meyer writes : " Es scheint mehr Astrologie als Botanik zu enthalten," a statement which, together with another that " nur eine neue Auflage desselben ist wahrscheinlich," shows that he himself did not have access to the works. Ames is the chief authority to whom one would naturally turn for descriptions. In his " Typographical Antiquities " nine editions are recorded. In the present paper, particulars of no less than seventeen will be found, fourteen of which are actually in existence, and have been described directly from the books themselves. The descriptions of the other three are quoted from Ames.

The following titles and colophons are arranged in chronological order according to their printers, and approximate dates are assigned to a few of the undated copies. The first is that printed by Richard Banckes.

Title.—❡ Here begynnyth a new mater / the whiche sheweth and | treateth of yᵉ vertues & proprytes of her- | bes / the whiche is called | an Herball | ∴ | ❡ Cum gratia & priuilegio | a rege indulto. | [*Woodcut of plant with three conventional pieces or borders.*]

Colophon.—❡ Imprynted by me Rycharde Banckes / dwellynge in | Lōdō / a lytel fro yᵉ Stockes in yᵉ Pultry / yᵉ xxv. day of | Marche. The yere of our Lorde. M.CCCCC. & XXV. Black Letter, 4to, A—l in fours.

In the following year, 1526, Banckes issued another edition. The wording of both titles, with the exception of slight variations in the

spelling, is found to be identical.   Similar variations are noticed in the
two colophons.   As regards the text of the later edition, I am unable to
say whether the same characteristics' prevail, as I have not examined the
copy personally, and am indebted to the kindness of Mr. H. G. Aldis, M.A.,
of the Cambridge University Library, where the work is to be found, for
supplying the title and colophon.

Title.—℃ Here begynneth a newe marer / yᵉ whiche sheweth and |
treateth of the vertues & propertes of her- | bes / the whiche is callyd |
an Herball. | ∴ | ℃ Cum priuilegio. | [*Border pieces and other ornaments
in lower part of page.*]

Colophon.—℃ Imprynted by me Rycharde Banckes / dwellynge in |
Lõdõ / a lytell fro yᵉ Stockes in yᵉ Pultry / ye. xxv. daye of June.   The
yere of our Lorde, M.CCCCC. & XXVI.   Black letter, 4to, A—1⁴.

The work contains 206 chapters, each containing an account of a
herb, and arranged in the order of the alphabet.   Concerning its author-
ship, nothing definite is known.   According to the late Dr. Payne, it had
" no connection with any herbal printed on the Continent, and was
probably an abridgment of some mediæval English manuscript on herbs."
Manuscripts of this kind were numerous in England during the
fourteenth and fifteenth centuries, and some are still preserved in a few
of the more important libraries.   This subject will be referred to later
in the remarks concerning Wyer's editions.

The next in order of date was probably that printed by Robert
Redman.

Title.— : A boke of | the propertyes | of herbes the | whiche is |
called an | Herbal | ✠ | [*Small woodcut.*]

Colophon.—Imprynted at | London in Fletestrete at | the sygne of
the George by | me Robert Red- | man ∴ | ✠ | [*Printer's mark.*]
Black letter, 8vo, A—I⁸, K⁴.

The approximate date assigned in the British Museum catalogue is
1530.   This cannot be far wrong.   It could not have been printed
earlier than 1530, and might possibly be attributed to 1531—32.
" Fletestrete at the sygne of the George " was the address until his death
of Richard Pynson (Redman's rival printer), who died between November
18, 1529, and February 18, 1530, the dates of the making and the proving
of his will.   Redman succeeded Pynson at the above address, and was
established there in 1530, as he began to use Pynson's device in that
year.   On account of the popular nature of the herbal, we might expect
it to be one of the first works to which Redman would turn his attention,
although he was printing from 1525 to 1530 at another address, and

does not seem to have issued an earlier edition. This edition of the work, therefore, could not have been printed before 1530, and must be assigned to a date between 1530 and 1540, the latter being the year of his death.

I am unable to trace an edition printed by John Skot. In the list of this printer's books, compiled by Mr. Gordon Duff, I find the following entry : " The Book of Herbes, 12mo. undated." This, of course, is not the exact wording of the title. The compiler did not gain access to a copy, as none of the catalogues of the chief British libraries records one, and it is doubtful whether a copy is now in existence. I quote the following notice from Herbert's edition of Ames, 1785 :—

" ' A boke of the propertyes of herbes the which is called an Herbal.' Contains K⁴. ' At the end, Imprynted at London by me John Skot dwellynge in Fauster Lane.' This over his device which is his cypher on a shield, hung on a rose-tree, flowering above the shield, supported by two griffins; at the bottom is a dog nearly couchant ; I.S. the initials of his name, one on each side of the trunk of the tree. In the collection of Mr. Alchorne. Twelves."

Details of Skot's life are scanty, but his earliest address was " in the Parish of St. Sepulchre outside Newgate," where he issued his first dated book in 1521, his device at this time consisting of " his mark and initials on a shield surmounted by a helmet and supported by two dragons." By 1528, he was established in St. Paul's churchyard, where he used a new device as well as a modification of the old one. His last dated book, 1537, and five undated ones were printed in " Fauster Lane in St. Leonard's Parish." His edition of the herbal was printed at this last address, and must therefore be ascribed to the latter part of his career. It was probably printed between the year 1532 and the date of his disappearance in 1537.

The next three editions were printed by Robert Wyer. They are all without dates, but as far as I am able to ascertain, the following is their order :—

Title.—℃ A newe Her- | ball of Macer, | Translated | out of La- | ten in to | Englysshe.

Colophon.—℃ Imprynted by | me Robert wyer, | dwellynge in saint Martyns pa | ryshe, at the sygne of saynt | John Euangelyst, | besyde Charyn | ge Crosse. | ✠. Secretary type, 8vo, A—P.⁴

Title.—℃ Hereafter folo | weth the know- | ledge, proper | ties, and the | vertues of | Herbes.

Colophon.—℃ Imprynted by | me Robert wyer, | dwellynge in

saynt Martyns pa- | rysshe, at the sygne of saynt | John̄ Euangelyst, | besyde Charyn | ge Crosse. | ✠ | [*Printer's mark*] Secretary type 8vo, A—P.[4]

Title. — Macers | Herbal | Practy- | syd by | Doctor | Lynacro | Translated out of laten, | into Englysshe, which | shewynge theyr Ope- | racyons & Vertues, | set in the margent | of this Boke, to | the extent you | myght knowe | theyr Ver- | tues.

Colophon.—Imprynted by | me Robert wyer | dwellynge in seynt Martyns Pa- | rysshe at the sygne of seynt | Iohn̄ Euangelyst, besyde Charyn- | ge Crosse. [*Printer's device*]. Black letter, 8vo, A—W.[4]

The dates assigned to these works in the British Museum Catalogue are 1535, 1540, and 1530 respectively. Now a characteristic of Wyer's books is that not more than eight or nine, out of a series of more than one hundred, show the year of printing. It is, therefore, a difficult and dangerous task for one who is not a practical printer or typefounder to assign any date from a comparison of the types alone. Mr. Henry R. Plomer made a study of Wyer's books, and came to the conclusion that the " Secretary " type—so-called from its resemblance to the manuscript writing of the period—was used for the text of all books printed down to 1542. But in 1542, and from that time onwards, the order was reversed, the text of all books being printed in Black Letter, and the supplementary matter in " Secretary." Of the three editions quoted above the first and second are in this " Secretary " type, and as the approximate dates ascribed to these— namely, 1535 and 1540—fall in the period during which this type was employed, and as, also, there is no evidence to show that they were not printed during that period, they may be allowed to stand. But according to Mr. Plomer's theory, the third edition, the text of which is in black letter, must be assigned, not to the year 1530, but to a date later than 1542. Apart from the question of types, Mr. Plomer was of the opinion that this edition was later than the one ascribed to 1535, on account of " an addition to the text of herbs under (A)." But this consists only of two single lines obscurely placed at the end of A, immediately preceding B. They are of no importance, and seem to me to prove nothing. The order of the editions might just as well have been reversed and the lines omitted.

Some interesting observations may be made with regard to two of these editions printed by Wyer. It will be observed that the title- pages represent the work to be a translation of the Latin poem of

Macer on the virtues of herbs, and is so styled by Pulteney, who calls it a "jejune performance written wholly on Galenic principles." Other writers have followed Pulteney, but they do not seem to have examined these books, and their only authority is Wyer's new title-page. The herbal is supposed to have no connexion with the work of Macer, and that Wyer simply published it under that name to give it a high-sounding and attractive title, and thus enhance the chances of sale. I am not inclined either to support or question this supposition. My original intention was to ascertain to what degree, if any, Wyer was justified in affixing Macer's name to the work, but as the materials are only accessible in the British Museum, and official duties only permit of occasional visits to that library, I have been unable to carry out my desire. The original poem of Macer consisted of an account of the virtues of seventy-seven herbs. As Wyer's edition contains accounts of almost double that number, it will be seen that it is not a translation of the original poem, but as Macer's work was the most popular herbal of the Middle Ages, various manuscripts came into existence, modified and augmented to such an extent that, although they appear with the name of Macer, they are in reality different works. These manuscript herbals, purporting to be copies and translations of that writer, are probably the most common of all the manuscripts treating of the virtues of herbs. In the British Museum there are several belonging to the fourteenth and fifteenth centuries. bearing this name, which show that the work was popular in England at that period. Bishop Tanner, quoted by Pulteney, refers to a fourteenth-century translation by one, John Lelamour. This found its way into the library of Sir Hans Sloane, and is now in the British Museum, together with other manuscripts on herbs belonging to the same collection. Lelamour's version I once hastily examined, and compared it with the printed editions of our herbal by Wyer. From the notes I made at the time, I found that it consisted of a number of chapters about equal to, or slightly in excess of, the number in Wyer. Of those I compared the majority seemed to have no connexion with the corresponding chapters in the printed herbal, but a few here and there agreed almost word for word. Wyer's employment of the name Macer, as far as Lelamour's manuscript is concerned, seems therefore to some extent justified, but his printed edition cannot be called a direct translation of the original seventy-seven chapters in verse which appeared with the name of Macer.

The above remarks concerning the agreement of a few chapters in Wyer's herbal with the corresponding chapters in Lelamour's manuscript

A—13

apply also to Banckes' herbal, for the text of Wyer's book must be
regarded as another edition of Banckes'. There are, however, a few
differences. The chapters in Wyer's three editions number 183 against
206 in Banckes', and some contain slight additions to the text. At the
end of the books there are three additional chapters which are not found
in Banckes' : (1) The vertue of the oken tre ; (2) The makynge of aqua
vite perfectissima ; (3) Graffynge & plantynge.

The statement that Wyer had no justification for the use of Macer's
name on his title-page is more applicable to Linacre. Pulteney, in his
reference to Macer's herbal, was led into making the remark that " even
Linacre did not disdain to employ himself on this work." Such, how-
ever, was not the case. Linacre died five or six years before Wyer began
to print, and there is no doubt that the honoured name was surrepti-
tiously used to lend undue authority to the work. Whether or not Wyer
was censured for this nefarious procedure I cannot say, but Linacre's
name never appeared in later editions, although the same printer issued
another book with the title, " Tho. Linacre, Doctor of Phisick, his com-
pendious regiment, or dietarie of health used at Mount Pillour " (i.e.,
Montpelier). It is doubtful whether a copy of this exists. Maunsell
records it in his catalogue of 1595. Needless to say, Linacre wrote no
such work.

The next two editions of the herbal were printed by Thomas Petyt
in 1541, and by William Middleton in 1546. Both are dated, and, like
Banckes' edition, the text begins with " Agnus Castus " and ends with
" Wormwood." The only copies I have been able to trace are in the
Bodleian Library, and to Mr. Falconer Madan, M.A., I am indebted for
copies of the title-pages and colophons.

Title.—A boke of | the propertyes | of herbes the whiche | is called
an Har | bal, M.D. | XLI. |

Colophon.—⏀ Imprynted at London | in Paules churchyearde, | at
the Sygne of the may- | dens head by Tho- | mas Petyt. | M.D.XLI. |
Black letter, 8vo, A—I,⁸ K.⁴

Title.—A boke of | the propertyes | of herbes the | whiche is | called
an | Herbal.

Colophon.—Imprinted | at London in Fletstrete | at the sygne of the
George | nexte to seynt Dunstones churche | by me Wyllyam Myddyl-
ton | In the yere of our Lorde | M.CCCCC.XLVI. | The thyrde day |
of July | Black letter, 8vo, A—I,⁸ K.⁴

The following edition was printed by John Waley (or Walley) :—
Title.—⏀ A boke of | the propertes | of herbes the | which is

cal | led an her | bal. | ✠ | [*Woodcuts representing Job and Amos at the bottom.*]

    Colophon.—Imprynted at | London by | Johan Waley, | dwellynge in | Foster Lane. | [*Woodcut of St. John the Baptist*]   Black letter, 8vo, A-H⁸, K⁴.

    The only copy I have been able to find is in the library of the Manchester Medical Society, and I am indebted to the Librarian, Mr. A. F. C. Davey, for the above title and colophon. This edition is also undated, but in the old catalogue of the library the year is given as 1548. On what authority this has been fixed I cannot say, but from a comparison with other editions of the work, and in the absence of further details concerning the life of the printer, this date, I think, must be allowed to remain. As John Waley did not begin to print till 1546, the book could not have been published before that date. As in the case of other printers, Waley would probably make this popular work one of his earliest productions. This conjecture is also supported by the address in the colophon, " Foster Lane," where he was first established. Now to limit the probable period of the printing we must observe that two editions of the herbal printed by Wm. Copland, assigned to the years 1550 and 1552, have title-pages which show a considerable and well-marked deviation in the general wording. With the exception of Wyer's edition, previous issues have borne a short and simple title such as that of the present edition by Waley. Copland's title, then, seems to mark a new era in the career of the herbal, and may be regarded as the first of a series of descriptive and much longer titles, in which all later editions, with one exception, may be included. Those prior to Copland's may therefore be classed as a series of particular titles, the last of which was probably Waley's. Moreover, Copland's editions contain for the first time three additional chapters on " The virtues of water's stylled," " The tyme of gathering of sedes, etc.," and " A generall rule, etc.," which, I believe, are to be found in all later editions. If Waley's had been printed later than Copland's, it is reasonable to suppose that he would have followed the practice of all the later printers by including these additions, as any indication that the work contained extra matter would have enhanced the chances of sale. But Waley closely follows the earlier editions of Banckes, Petyt and Middleton, and I should therefore judge his work to have been printed prior to that of Copland. If, therefore, the year assigned to Copland's earliest issue be correct—namely, 1550—Waley's must have been printed between 1546 and 1550. On this supposition the date 1548 may be allowed to stand.

The most interesting of all the editions of this little herbal are those printed by William Copland. As already stated in the remarks concerning the last printer, the title-pages of Copland's issues mark a new era in the career of the work. On account of the new wording of the title and the appearance of the initials " W. C.," two important errors have arisen concerning the authorship of the work. These will be referred to later.

Title.—A boke of the | propreties of Herbes called an her- | ball, whereunto is added the tyme y^e | herbes, floures and Sedes shoulde | be gathered to be kept the whole ye- | re, with the vertue of ye Herbes whē | they are stylled. Also a generall rule | of al manner of Herbes drawen out | of an auncient boke | of Physycke by | W. C. | [*Wood-cut of three roses in triangular position within a double circle ; upper rose crowned ; riband, " Kȳge of floures."*]

Colophon. — Imprinted at London by Wyllyam | Copland. | Black letter, 8vo, ℭ ✱ ⁴, A—I⁸, K⁴.

Title.—A boke of the | propreties of Herbes called an her | ball, whereunto is added the time y^e | herbes, floures and Sedes shold | be gathered to be kept the whole | yere, wyth the vertue of ye Her- | bes when they are stilled. Al- | so a generall rule of all ma- | ner of Herbes drawen | out of an auncyent | booke of Phisyck | by W. C. | [*Woodcut of garden with lady seated ; man approaching, and another holding her from behind. Wall in background, over which are men apparently in consultation.*]

Colophon. — ℭ Imprynted at London in the | Flete strete at the sygne of | the Rose Garland by | me Wyllyam Copland. | for John wyght. | Black letter, 8vo, A—K⁸.

Both are undated. In the British Museum Catalogue, the former is assigned to the year 1550, and the latter to 1552. Like Banckes's edition, the text of each begins with " Agnus Castus " and ends with " Wormewood." Although the corresponding chapters agree word for word throughout, they are two distinct and different issues. But in addition to the text of Banckes's, these editions by Copland contain for the first time the three extra chapters already quoted : (1) " The vertues of waters stylled " ; (2) " The tyme of gathering Sedes, floures, herbes, and Rootes . . ." (3) " A generall rule of all maner of herbes . . ."

In the former edition the second and third of these additions precede the first chapter of the text, " Agnus Castus," while the first falls between the end of the text " Wormewood " and the " Table." In the latter

edition their position is changed. The first and second take the place of the second and third, while the third follows the " Table."

The interesting point concerning Copland's issues is that the initials " W. C." on the title-page have given rise to two curious errors regarding the authorship of the works. By present-day cataloguers and bibliographers these initials have been taken as representing the names " Walter Cary " and " William Copland," and under one or the other of these many editions are frequently found. In the British Museum Catalogue, Walter Cary is credited with the authorship, and Copland is stated by his biographer in the " Dictionary of National Biography " to be the compiler. Bishop Tanner also refers to Copland as the editor. With regard to Walter Cary, I should say that Ames (or Herbert) was probably the first to ascribe it to that author. In the monumental work, " Typographical Antiquities," various editions are catalogued. In the entry describing one published by Anthony Kitson we find the name " *Walter Cary* " added in italics after the initials " W. C." This is evidently the authority on which later bibliographers have ascribed the work to Cary. But it is clear that Ames (or Herbert) had no positive knowledge concerning either the work itself or the supposed author, for in his description of another edition printed by Copland he adds, after the same initials " W. C.," the words " probably himself," which means, of course, that William Copland was probably the author. Had the contents and the origin of the work really been known to him, he would not have ascribed two separate editions to two different authors.

This error suggests the question, " Who was Walter Cary ? " I know of no medical writer of this period other than this author whose name could be represented by the initials " W. C." But details concerning the life of Cary are not easily found. The standard biographical works such as Tanner, Cooper, Wood, Munk, and the " Dictionary of National Biography " contain no reference to him, and no mention of his name is to be found in the indexes to the Sloane, Harleian, Stowe, and additional MSS. Even a request for information in *Notes and Queries* brought forth no reply.[1] Cary was

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[1] At the moment of going to press there appears in *Notes and Queries* (March 29, 1913) a lengthy and important account of the Cary family by Mr. A. L. Humphreys, who refers to an entry which escaped my notice in W. D. Macray's " Register of Magdalen " : " Walter Carie or Carey, co. Bucks, elected for dioc. Chichester, Demy, 1561 (Reg. p. 160). M.A. lic. March 24. 157½, inc. July 14. On Feb. 8, 1573, he had six months' leave ' causa promotionis.' Resigned 1574."—New Series (London, 1897), vol. ii, p. 184. Mr. Humphreys also draws attention to a passage in " The Hammer for the Stone," 1580, which indicates that the author lived at High Wycombe. This passage I noticed when I examined the work, but did

however, the author of the works, " Carie's farewell to Physicke," 1583,
" The Hammer for the Stone," 1581, and, according to the British
Museum Catalogue, " The Present State of England," &c., 1626.
Now, if Cary wrote as late as 1626, it is obvious that he could
not be the author of the herbal printed in 1550, which was another
edition of the work printed by Banckes in 1525. But owing to the
fact that the " Present State of England " was not a medical book,
and that, also, an interval of forty-five years separated the work from
" The Hammer for the Stone," 1581, I am not perfectly satisfied that
Cary was publishing as late as 1626. Moreover, we are confronted
with the tantalizing information by Hazlitt that editions of the
" Hammer for the Stone " were printed by R. Kele (without date),
W. Myddylton, 1546, and T. Petyt, 1543, which, if correct, makes
Cary a contemporary of Copland and kills the argument that he
could not have been the author of the herbal on account of his
having lived at a period much too late. But I am equally appre-
hensive that no such editions existed, as Hazlitt's information does
not consist of bibliographical descriptions, but only references to these
editions, which proves that he never saw them. The edition of 1546
is also entered under Myddylton's books in Duff's " Hand Lists," but
the book itself was not examined by the compiler, as the absence of the
name of any library after the entry of the work indicates that no copy is
to be found either in the British Museum, the Bodleian, Cambridge
University, or in other libraries, the catalogues of which are accessible.
The entry was probably quoted from Hazlitt. Moreover, the prob-
ability that these editions never existed is increased by evidence that
Cary was living as late as 1611. In an edition of his " Farewell to
Physicke " published in that year one finds " A caveat (from the

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not quote as it threw no light on Cary's supposed association with the herbal. The following
passages are taken, apropos of my own remarks, from Mr. Humphreys's valuable account of
the Cary family, which is the result of a search among the records of the ancient town of
High Wycombe : " ' A Boke of the Propreties of Herbes ' . . . bears on the title-page the
initials ' W. C.,' which may stand either for Copland or Cary. This was one of several
editions of Banckes's ' Herbal,' then very popular, and, although it may have been edited or
promoted in some way by a Walter Cary, it could not have been by the one who wrote ' The
Hammer for the Stone.' The ' Herball ' was issued somewhere about 1550, and various
editions of it exist, . . . but all these appeared when the Walter Cary we are considering
was a child. There is, however, a connexion between the Carys and herbals, because it is
well known that Henry Lyte (1529-1607) of Lytes Cary was the famous translator of Dodoen's
' Herball,' 1578, and he had a herbal garden at Lytes Cary. . . . It seems certain that
' The Hammer for the Stone ' and ' The Farewell to Physick ' were written by Walter Cary of
High Wycombe, M.A. of Magdalen ; but, from the dates, it is impossible that the same
Walter Cary could have written the Herbal, and most improbable that he wrote ' The Present
State of England.' "

Authour) to the Reader," signed "W. Carie," complaining that "W. White hath printed this book without my consent," and therein "abused me the author." From this it is evident that Cary was alive in 1611, and was not then too old to be interested in literary work. This proves beyond a doubt that Cary could not have been the author of our herbal, for the edition bearing the initials "W. C.," printed about 1550, was another edition of "Banckes' Herbal" of 1525. Assuming, then, that the author or compiler was at least aged 25 when the work was first published, the date of his birth would be 1500. He would not therefore be writing "caveats" in the year 1611.

Having disposed of Walter Cary, we must now consider William Copland, whose association with the work was that of printer. Three or four editions are attributed to his press, and the only authority, so far as I am aware, for the statement that he compiled the work was the conjecture of Ames (or Herbert), already quoted. When the two books were examined, the connexion between Copland's edition and those by earlier printers was evidently unnoticed, and the new, elaborate title with the initials "W. C." gave the book the appearance of an entirely new work. It was only necessary for Ames to have had an earlier edition in his hands, when he described the one printed by Copland, to see that the texts were identical almost word for word. Copland's issue, with the exception of the three additional chapters, was another edition of "Banckes' Herbal." But, as these additions were printed for the first time by Copland, it is quite possible that they were "drawen out of an auncyent booke of Phisyck" by Copland himself. If the title is examined once more, it will be seen that this theory is quite tenable.

Two other editions, published by Anthony Kitson and Richard Kele, must, I think, be ascribed to Copland's press. Of these I have not been able to locate any existing copies, and therefore can only quote their titles from Ames. The following is Kitson's edition :—

" A booke of the properties of Herbes, called an Herball. Whereunto is added the tyme that Herbes Floures and Seedes should bee gathered to bee kept the whole yeare, wyth the vertue of the Herbes when they are stylled. Also a generall rule of all maner of Herbs, drawen out of an auncient booke of Physicke by W. C., *Walter Carey*. Contains besides X⁴ in eights, For him."

It will be observed that the wording of this title, with the exception of variations in the spelling, is the same as those by Copland just

described. This also is undated. Ames gives no colophon, and it is therefore difficult to fix the year of printing and to ascertain from whose press it was issued. Kitson published very few books, and these were printed for him by others. As Copland printed editions of this herbal for John Wight and Richard Kele, I should say that he printed Kitson's edition also. The new title, which was Copland's innovation, supports this conjecture. · The signatures "X⁴ in eights" attract the bibliographer's attention. I should imagine this to be a misprint for "K⁴ in eights." To have contained X in eights, the book would have been extended to twice its original length, and from my acquaintance with previous editions I cannot conceive that the present issue underwent such a considerable augmentation. The following, published by Richard Kele, is said to have been taken by Herbert from an imperfect copy :—

"The book of the properties of herbes, called an herball, etc., drawn out of an ancient book of phisyck by W. C. (probably himself) and with it a book of the seeing of vrynes of all the colours that vrynes, and with the medycynes annexed to euery vryne, and euery vryne hys urynall. For R. Kele, 12 August."

The size is octavo, and the date assigned in Ames is 1552, but in Duff's "Hand Lists" it is given as 1550. In any case it could not have been later than 1552, for in that year Kele died. The majority of his books were printed for him by W. Copland, W. Seres, or R. Wyer.

Another writer, who has been described as the author of two editions of the herbal, is Anthony Askham or Ascham, a priest, astrologer, and physician, who graduated M.B. in 1540, and was presented by Edward VI, in 1553, to the living of Burneston, in Yorkshire. In 1550 there appeared :—

Title.—A lytel | herball of the | properties of her- | bes newely amended and corrected, | with certayne addicions at the ende | of the boke, declaryng what herbes | hath influence of certaine Sterres | and constellations, wherby may be | chosen the beast and most luckye | tymes and dayes of their mini- | stracion, accordynge to the | Moone being in the sig- | nes of heauen, the | which is dayly | appoynted | in the | Almanacke, made and gathered | in the yere of our Lorde god | M.D.L. the xii day of Fe- | bruary by Anthonye | Askham Phi- | sycyon.

Colophon.—Imprynted at | London in Flete- | strete at the signe of the George | nexte to Saynte Dunstones | Churche by Wylly— | am

Powell. | In the yeare of oure Lorde | M.D.L. the twelfe day of Marche. Black letter, 8vo, A—K⁷. (A perfect copy A—K⁸.)

This book, together with a later edition printed by John King, is always attributed to Askham, and is placed under his name in bibliographies and catalogues. It has become known as " Askham's Herbal," and he is even credited with the authorship by his biographer in the " Dictionary of National Biography." I have examined the work, and have no hesitation in describing it as another edition of " Banckes' Herbal," 1525. There are, however, fewer chapters, these numbering 185 against 206 in Banckes, but copied practically word for word from the corresponding chapters in the 1525 edition. Under the letter A there is a slight rearrangement into stricter alphabetical order.

It is difficult to assign any part of this book to Askham. One searches in vain, not only for any indications of original additions by this writer, but also for any justification, however slight, for the association of his name with the work. The "certayne addicions at the ende of the boke" are not to be found, and I do not suppose they were ever printed. The text, like that of Banckes', ends with " Wormwode," and is followed by the " Table." For the omission of these additions I am unable to assign any reason. With the exception of the last leaf, which is blank, and is wanting in the copy I examined, the book is complete, and must have been published without them. This curious fact is all the more difficult to understand when we find that Powell printed nearly all the works attributed to Askham. If the bibliographers who have ascribed the work to this author had examined the title with greater care they would have observed that the phrase " by Anthonye Askham " refers not to the substance of the book itself, but to the " Almanacke," from which the additions were intended to be taken.

As all Askham's pieces are exceptionally scarce it is rather a pity that these additions, consisting evidently of a curious mixture of herbal medicine and astrology, were not included. It would have been interesting to learn what was the teaching of this astrologer, priest, and physician, whose liberal education, thought Pulteney, should have secured him from such delusion. One of his works, published in the same year as the herbal, and by the same printer, treats of astrological botany, but, like the Almanack, it is so scarce that I have not been able to trace a copy. It is known by the title: " Anthony Ascham his Treatise of Astronomie, declaring what herbes and all kinds of medicines are appropriate, and under the influence of the Planets, Signs, and Constellations; also how ye shall bring the virtue of the heavens, and nature of the

starres to every part of man's body being diseased to the sooner recouerie."

Another edition bearing Askham's name was printed by John Kynge. It is copied from that printed by Powell, and has the same title, with the usual variations in the spelling :—

Title.—A litle Her- | ball of the properties of Herbes; | newly amended and corrected, wyth | certayne Additions at the ende of | the boke, declaring what Herbes | hath influence of certain Sterres | and constellations, whereby maye | be chosen the best and most lucky | tymes and dayes of their mini- | stracion, according to the Moone | beyng in the signes of heauē | the which is daily appoī- | ted in the Almanacke, | made and gathe- | red in the yeare | of our Lorde | God. | M.D.L. | the xii. daye of Febru- | ary by Anthony Askhā | Physycyon. |

Colophon.—Imprynted at London, in | Paule's churchyarde, at the | signe of the Swanne, by | Jhon Kynge. | Black letter, 8vo, A—K⁷. (A perfect copy A—K⁸.)

The colophon bears no date, and the year 1550 mentioned on the title-page, which relates to the "Almanacke," and not to the book itself, has been quoted by bibliographers as the date of publication. This is the date assigned to the work in the British Museum catalogue. King, however, did not begin to print until 1555, and the book, therefore, could not have been printed before that year. A more probable date would be 1556—7.

The last edition of "Banckes' Herbal" we have to consider was also printed by John Kynge, who this time followed the title given to the book by Copland, rather than that by Powell, which he copied in the edition just described.

Title.—ℭ. A boke of the | propreties of Herbes called an her | ball, whereunto is added the time yᵉ | herbes, floures and Sedes shold | be gathered to be kept the whole | yere, with the vertue of yᵉ Her | bes when they are stilled. Al- | so a general rule of al ma- | ner of Herbes drawen | out of an auncient | boke of Phisyck | by W. C. | [*Woodcut.*]

Colophon.—ℭ. Imprinted at London by | Jhon kynge, for | Abraham Wely. | Black letter, 8vo, A—K⁸.

This contains the same number of chapters as Banckes' edition, as well as the additions found for the first time in Copland's. It is also undated, and I am unable to say whether it was earlier or later than the other edition by the same printer. Details concerning Wely's life afford no clue, but it must have been printed between 1555, the year when King began to print, and 1561, the date of his death.

In concluding these notes on the various editions of the first herbal printed in England, it is perhaps necessary to explain why they have been made the subject of such a considerable portion of this paper. The explanation must be that this, I believe, is not only the first occasion on which they have been collectively described, but also the first attempt to remove the obscurity that has long existed concerning their authorship, so far at least as it concerns the printer, Wm. Copland, and the writers, Walter Cary, Anthony Ascham, and Thomas Linacre. With regard to the origin of the herbal, I think it will probably be found in one or more of the numerous fourteenth or fifteenth-century manuscripts on the virtues and properties of herbs which are still preserved in various libraries of this country. The issue may not be important, but here is a field of interesting research for the leisured student of this fascinating old literature.

" THE GRETE HERBALL."

A year after the publication of " Banckes' Herbal," 1525, there appeared the first of the larger series of profusely illustrated books which were based chiefly on works printed on the Continent.

Title.—The grete herball | whiche geueth parfyt knowlege and under- | standyng of all maner of herbes & there gracyous vertues whiche god hath | ordeyned for our prosperous welfare and helth, for they hele & cure all maner | of dyseases and sekenesses that fall or mysfortune to all maner of creatoures | of god created, prac- tysed by many expert and wyse maysters, as Auicenna and | other &c. Also it geueth full parfyte understandynge of the booke lately pryn | ted by me (Peter treueris) named the noble experiens of the vertuous hand | warke of surgery. [*Woodcut of a man, with a spade in his right hand, gathering grapes, and a woman emptying herbs and flowers out of her apron into a basket. In the lower corners two figures representing a male and female mandrake.*]

Colophon, preceded by full-page woodcut of printer's mark.—℣, Im- prentyd at London in South- | warke by me peter Treueris, dwel- | lynge in the sygne of the wodows. | In the yere of our Lorde god. M.D. | XXVI. the xxvii. day of July. Black Letter, folio, ✠⁶, A—Z⁶, Aa—Ee⁶.

According to Ames, the first edition of this work appeared in 1516, but no trace of any copy bearing this date can be found. It is doubtless an error, as Treveris did not begin to print until 1522.

The second edition was also printed by Treveris in 1529. It is a copy of the first, without additional matter. The wording of the title is the same, but it will be observed that the last three lines do not contain the same number of letters. This fact, together with variations in spelling, shows that the type was set up afresh, and is, therefore, a new edition, not a re-issue of the original sheets with a new title-page. The colophon differs from the first in that it does not contain the printer's address.

℃, Imprynted at London in South | warke by me Peter Treueris. In | the yere of our Lorde god. M.D.XXIX. | the xvii day of Marce. Black letter, fol., ✠⁶, A—Z⁶, Aa—Ee⁶.

The colophons of both editions are preceded, on the same page, by the printer's mark, the top and bottom parts of the border of which are different. In addition to the 505 chapters on the virtues and properties of herbs, trees, and some minerals, arranged in the order of the alphabet, both editions contain an " exposicyon of wordes obscure " and a treatise on urines : *Sig. Cc. iiii, recto., bottom of col. 2.*—Hereafter foloweth the knowlege of ye dyuersytees and colours of all maner of urynes.   .   .   . With regard to the authorship, it is necessary to quote the latter portion of the preface, but as this part of the book illustrates the medical ideas which prevail throughout these herbals, more especially the earlier ones, it is thought desirable to quote it in full. In reading of the virtues and healing properties we constantly come across such sentences as these :—

> This herb is hot and dry
> This herb is cold and moist, etc., etc.

These at once suggest the well-known theory adopted by Hippocrates regarding the four elements—Fire, Water, Earth, and Air. Upon this theory Galen based the hypothesis which ascribes to the properties of medicines and herbs the four qualities (or " principles " or " natures "), Heat, Cold, Dryness, and Moisture. In the four elements the four qualities were combined in pairs, thus :—

> Fire was hot and dry.
> Air was hot and moist.
> Earth was cold and dry.
> Water was cold and moist.

By the maintenance of an equable proportion and intermixture of these qualities the body of man was healthy and free from sickness. Disease was the result of their inequalities. The aim of the physician, there-fore, was to promote qualities the opposite of those associated with the

existing disease, and from this standpoint the virtues of herbs were studied, and their heating or cooling properties determined. Each quality existed in four degrees. We thus find that a herb is hot or cold, moist or dry, &c., in the first, second, third, or fourth gradation.

The introduction to the " Grete Herball " is as follows : " Consideringe the greate goodnesse of almightye God, creatour of heauen and earthe, and all thinge therein comprehended, too whome be eternall laude and prayse, etc. Considering the course and nature of the foure elementes and qualities, where to the nature of a man is inclined, out of the which elementes yssueth diuers qualities, infirmities and diseases in the corporate body of man, but God of his goodnes, that is creatour of all thinges hath ordeyned too hys owne likenesse, for the great and tender loue, which he hath unto hym, to whom all thinges earthely he hath ordeined to be obeysant for the sustentacion and health of hys louyng creature mankynde, whiche is onely made egally of the foure elementes and qualities of the same, and whan any of these foure habounde, or hath more dominacion the one than the other, than it constrayneth ye body of man to great infyrmities or diseases, for the whiche the eternall God hath geuen of his haboundante grace, vertues in all maner of herbes, to cure and heale al maner of sekenesses or infirmities, to hym be falling through the influent course of the foure elementes beforesayde, and of the corrupcions and the venymous ayres, contrary the health of man. Also of unwolsame meates or drynkes, or holsame meats or drynkes, taken untemperatly, which be called surfetes, that bringeth a man sone to great diseases or sekenesse, whiche diseases ben of numbre and unpossible to be rehersed & fortune as wel in vilages, where as nother Surgeons nor Physicians be dwellynge nygh by many a myle, as it doth in good townes where they be readye at hande. Wherefore brotherly loue compelleth me to wryte throughe the gyftes of the holy Ghoste, shewynge and enformyng how man maye be holpen with grene herbes of the garden and wedes of the feldes, as wel by costly receptes of the potecarys prepayred. Also it is to be understande, that all maner of medecynes that be contrary to sekenesses, is for the great superfluyte of ye humours or the diminucion of them, or for to restrayn the ours, where it is agaynst the feblenesse of ye vertues, for the alteration or solucion of contynuetes or woundes or other begynnynges, etc. It also to be understande that we fynde medecyns symple, laxatyfe, appetisant and mynysshinge the superhabundance of humours, and also symple medecynes curās, and also medecynes alteratyfes and consolidatyfes," &c.

The following is the remaining part of the introduction relating to the authorship: " This noble workes is compyled, composed, and auctorysed by dyuers & many noble doctoures and experte maysters in medecines, as Auicenna, Pandecta, Constantinus, Wilhelmus, Plate-arius, Rabbi moyses, Johannes mesue, Haly, Albertus, Bartholomeus, and more other," &c.

But this is not a sufficient explanation of its origin. The text was not compiled by any English writer directly from the authors quoted. With the exception of the preface and the supplement, it is a translation of the popular French work, " Le Grant Herbier," the source of which has been the subject of some speculation. It has been regarded by Choulant as derived from the Latin " Ortus Sanitatis," and by others from the German "Herbarius zu Teutsch." These were printed at Mainz in 1485 and 1491 respectively. But thirty years ago new light was thrown on its origin by an Italian authority, Professor Giulio Camus, who found in the Biblioteca Estense at Modena two manuscripts belonging to the fifteenth century. One of these, in Latin, is a treatise on simple medicines, of which the other, in French, is a translation. According to Professor Camus, the Latin manuscript is the work which went through many printed editions, and was popularly known as the " Circa Instans," from the first words of its introduction, which begins, " Circa instans negotium de simplicibus medicinis nostrum versatur propositum," &c. This has long been attributed by medical historians to Matthæus Platearius, a physician of Salerno in the twelfth century. The " Explicit " of this Latin manuscript is reproduced in facsimile in Professor Camus's memoir, " L'Opera Saleritana ' Circa Instans ' ed il, testo primitivo del ' Grand Herbier in Francoys,' secondo duo codici del secolo XV, conservati nella Regia Biblioteca Estense." It runs : " Explicit tractatus herbarum Dioscoridis et Platonis atque Galieno et Macrone translatate, manu et intellectu Bartholomæi minid' senis in arte speciarie semper infusus." Some French verses are also repro-duced. In these we read, "Il a esté escript Millcccc cinquante et huit." It appears, therefore, that the work " Circa Instans " was not written in the twelfth century by the Salernitan physician, Matthaeus Platearius, but.by one " Bartholomæus minid' senis " (? de Senis) in the year 1458. As Professor Camus's memoir was published in 1886, it is somewhat strange that no reference to it is to be found in the recent " Geschichte der Medizin " of Neuberger and Pagel, where the " Circa Instans " is still referred to as the work of Platearius. From this one may infer that the memoir is not well known—an inference supported by the fact

that it lies hidden away in the "Memorie della Reglia Accademia di Scienze, Lettere ed Arti in Modena," ser. 2, vol. iv, 1886, p. 49. It is worthy of a separate existence.

As the French manuscript of the " Circa Instans " is another version of " Le Grant Herbier," the text of our own " Grete Herball " is, therefore, derived from the same source. The preface and supplement, however, seem to find their origin in the German " Herbarius zu Teutsch " and the Latin " Hortus Sanitatis."

The woodcut figures which illustrate the first and second editions of the English work number 478, but they call for no special remarks. Unlike the illustrations in the later herbals of Turner, Lyte, and Gerard, they are of no importance in the history of botanical illustration. The majority, taken from those in the French edition, are reduced and inferior copies of the cuts in the German herbals mentioned above. In this instance one cannot do better than quote Pulteney : " Many are fictitious and many misplaced. In a variety of instances the same figure is prefixed to different plants, and in very few are they sufficiently expressive of the habit, to discriminate even a well-known subject, if the name applied did not suggest the idea of it. In some, these icons are whimsically absurd, especially in the animals and minerals."

Two later editions of the herbal appeared in England in 1539 and 1561, but these are less interesting than the editions printed by Treveris. One was printed by Thomas Gibson, and is entirely without cuts, while the other, printed by John King, only contains two figures of a man and a woman representing the male and female mandrake, the male figure being repeated at the beginning of the treatise on urines.

Title.—The great herball | newly corrected. | The contents of this boke. | A table after the Latyn names of all | herbes, | A table after the Englyshe names of all | herbes. | The propertees and qualytes of all | thynges in this booke, | The descrypcyon of urynes, how a man | shall haue trewe knoweledge of all seke- | nesses. | An exposycyon of the wordes obscure and | not well knowen. | A table, quyckly to fynde Remedyes | for all dyseases. | God saue the Kynge. | Londini in edibus Thome Gybson | Anno | M.D.XXXIX. [*The above title surrounded by woodcut border of classic design.*] Black letter, fol., 4 prel. ll., A—Z^4, Aa—Bb^4, Cc^6.

The introduction in the first and second editions of 1526 and 1529 is omitted in this, and its place taken by " The prenter to the reder." The address at the end of the text of those editions, " O ye worthy reders," &c., is also omitted, and instead of the original 505 chapters

there are only 481. An edition bearing the date 1550 is recorded in Ames, and referred to by Pulteney, but I have been unable to trace it, no such edition being found in modern catalogues and bibliographies. The following is what is generally accepted as the fourth edition.

Title.—The greate Herball, which | gueth parfyte knowledge & un- | derstandinge of al maner of her | bes, and theyr gracious vertues, whiche God hath ordeyned for | our prosperous welfare and health, for they heale and cure all ma- | ner of diseases and sekenesses, that fall or mysfortune too all | maner of creatures of God created, practysed by many | experte and wyse maysters, as Auicenna, Pandecta, | and more other, &c. ⓒ Newlye corrected and dili- | gently ouersene. In the yeare of our Lord | God. M.CCCCC.LXI. [*Woodcut different from that in editions of 1526 and 1529.*]

Colophon.—Imprynted at London in | Paules churcheyarde, at the signe of the Swane, | by Jhon Kynge. In the yeare of our | Lorde God. M.D.LXI. Black letter, folio, ✠⁶, A—X⁶, Y⁸, Aa⁶, Bb².

The three cuts have already been described. This edition follows that of Treveris more closely than does Gibson's. The original introduction, "Consideringe the grete goodnesse," &c., and the address at the end, " O ye worthy readers or practisiens," &c., are both included, and the " Table " gives 503 chapters.

TURNER'S HERBAL.

The first original English botanist of the sixteenth century was William Turner, Dean of Wells, Protestant divine, controversialist, and physician. He was born about 1510-15, and in 1531 was a Fellow of Pembroke Hall, Cambridge. Like his German contemporary botanists, Turner was a pronounced Lutheran, who threw himself heart and soul into the work of the reformers. He was, therefore, in constant trouble, and for preaching without a license was imprisoned and afterwards banished. Crossing to the Continent, he travelled extensively, studying botany under Luca Ghina at Bologna, and taking a medical degree either there or at Ferrara. On the accession of Edward VI, he returned to England, was appointed physician to the Duke of Somerset, became Dean of Wells in 1550, but was deprived of his office by Mary in 1553. He again crossed to the Continent and renewed his botanical studies, having a garden at Weissenberg and another at Cologne. When Elizabeth came to the throne in 1558, Turner returned, and was reinstated in his deanery, but four years later was again in trouble, being suspended for nonconformity. He died in 1568.

Turner has been called " The Father of English Botany," and justly so. He was the first English botanist who studied plants scientifically, and his work marks a new era in the history of the science in England. The superiority of his herbal over any of the earlier English publications is recognized immediately the comparison is made. This was published in three parts, the first in 1551.

Title.—A new Her- | ball, wherein are conteyned the names of Herbes in Greke, La- | tin, Englysh, Duch, Frenche, and | in the Potecaries and Herbari- | es Latin, with the properties | degrees and naturall places of | the same, gathered and made | by Wylliam Turner, | Phisicion unto the | Duke of So- | mersettes | Grace. | Imprinted | at London by Steven | Mierdman. | Anno 1551. | Cum Priuilegio ad imprimendum solum. | And they are to be solde in Paules Church-yarde.

Colophon.—Imprinted at London, By Steuen Myerdman, and they are to be soolde in Paules | churchyarde at the sygne of the sprede Egle by | John Gybken.

The title is within an elaborate woodcut border, the Royal Arms being at the top. On each side is an upper and lower figure (four in all), and between them the royal letters " E.R." The printer, Mierdman, was an Antwerp workman who came over to England as a Protestant refugee. The bookseller Gybken was also an alien member of the trade. The part is dedicated to " Edward Duke of Summerset." The second part was not published till eleven years later (1562) at Cologne by another printer, Arnold Birckman.

Title. | The seconde parte of Vuil- | liam Turners herball, wherein are conteyned the | names of herbes in Greke, Latin, Duche, Frenche, and in the | Apothecaries Latin, and somtyme in Italiane, wyth the ver- | tues of the same herbes with diuerse confutationes of no | small errours, that men of no small learning haue | committed in the intreatinge of herbes | of late yeares. | . . . | . . . | . . . | . . . | set furth by William | Turner Doctor of Physik. | [*Printer's mark.*] Imprinted at Collen by Arnold Birckman. | In the yeare of our Lorde M.D.LXII. | Cum gratia et Priuilegio Reg. Maiest.

This is dedicated to Sir Thomas Wentworth. The third part was printed in 1568, together with new editions of the first and second parts. This was the complete edition, published also at Cologne by the same printer, Birckman.

Title.—The first and seconde partes | of the Herbal of William Turner Doctor in Phisick, late- | ly ouersene, corrected and enlarged

A—14

with the Thirde parte, lately ga- | thered, and nowe set oute with the
names of the herbes, in Greke | Latin, English, Duche, Frenche, and in
the Apotheca- | ries and Herbaries Latin, with the properties, | degrees,
and naturall places of the same | . . . | . . . | . . . | set furth by
William Turner Doctor | in Phisick. | God saue the Quene | [*Woodcut
of Royal Arms.* | Imprinted at Collen by Arnold Birckman, In the yeare
| of our Lorde. M.D.LXVIII. | Cum Gratia & Priuilegio Reg.
Maiest.

The second part has a separate title-page.   So also has the third.

Title.—The thirde parte of Vuil- | liam Turners Herball, wherein
are conteined the | herbes, trees, rootes, and fruytes, whereof | is no
mention made of Dioscorides, | Galene, Plinye, and other | olde
Authores. | God saue the Quene. [*Woodcut of Royal Arms.*] Im-
printed at Collen by Arnold Birckman, In the yeare | of our Lorde
M.D.LXVIII. | Cum gratia & Priuilegio Reg. Maiest.

The first part of this complete edition of 1568 is dedicated to Queen
Elizabeth, and the third to "the right worshipfull Felowship and
Companye of Surgiones," &c.

Turner's early work consisted chiefly of the identification of the
plants described by Dioscorides and other ancient writers. . When he
published his first botanical work, " Libellus de re herbaria," 1538, being
then a Fellow of Pembroke Hall, he could " learne neuer on Greke,
neither Latin nor English name euen amongest the Phisiciones of anye
herbe or tre, such was the ignorance in simples at that tyme, and as yet
there was no English Herbal but one, all full of unlearned cacographees
and falselye naminge of herbes." In this work, and in the Herbal,
Turner used his classical scholarship to good purpose, and, as can be seen
from his own prefaces, he claimed for himself considerable originality—
a claim which has been allowed by modern botanists, although practically
ignored by his European contemporaries and immediate successors.
This was due, doubtless, to his fearless and searching criticism, which
contemporary herbalists resented. But while Turner criticized freely,
he did so honestly, and gave praise wherever he thought it due.
" Brunfels, Fuchsius, Gesner, Bock," he writes, " haue greatly promoted
the knowledge of herbs by their studies, and haue eche deserued uery
muche thanke, not only of their own countries, but also of all the hole
common welth of all Cristendome."

His studies and extensive travels on the Continent gave him
abundant opportunities of observing and collecting plants, and to these
enforced absences from England is perhaps due not a little of Turner's

originality. " I went into Italye and into diuerse partes of Germany to knowe and se the herbes my selfe, and to knowe by practise their powers and workinge, not trustinge onlye to the olde herbe wiues and apothecaryes (as manye Physiciones haue done of late yeres), but in the mater of simples myne owne eyes and knowledge : wherefore I have somthinge of myne owne to present and geue." He was therefore not afraid to expose the errors even of those whom he praised. In a letter to Fuchsius he " dyd frendlie admonishe him of certeyne erroures that were in his herball." Matthiolus, physician to the Archduke Ferdinand and to the Emperor Maximilian II, and the chief commentator of Dioscorides, naturally came in for a good share of criticism. With his interpretation of the classical writer Turner did not agree, and wrote, " Because Matthiolus is a learned man, therefore by the opinion of his learninge even wythoute good reason and autorite maye drawe other after him into his error ; for the defence of the trueth, I will confute hys error both wyth reason and sufficient authorite." Again, with regard to the same author, he writes : " I borrowed verye littel or ellis nothinge of Matthiolus, and when as the herbal of Matthiolus came out in Latine, many thinges that were thought straunge both unto English men and Germanes, were nether straunge nor unknowen unto me, because I had learned the same before of my maisters in Italye. . . . Yet do I graunte that of his herbal I learned somthinge, but not so addicte unto him, but that I wrote against him in some partes of my Herbal, where as I thought he erred, and they that haue red the first part of my herbal, and haue compared my writings of plantes with those thinges that Matthiolus, Fuchsius, Tragus, and Dodoneus wrote in ye firste editiones of their Herballes, may easely perceyve that I taughte the truthe of certeyne plantes, whiche these aboue named writers either knew not at al, or ellis erred in thē greatlye. . . . So that as I learned something of them, so they ether might or did learne somthinge of me agayne, as their second editions maye testifye."

I have quoted freely from Turner's prefaces as they reveal not only the nature and temperament of the man, but also his own estimate of the position he held among European botanists of his day. He was the only original English writer on the subject in the sixteenth century, and his herbal occupies in our own country a position similar to that which is held on the Continent by the herbals of the Renaissance scholar-botanists and physicians of Germany—Brunfels, Bock, and Fuchs—whose beautiful works mark the culminating point in the history of the herbal proper.

Turner's Illustrations.

Turner's work has just been described as the only original English herbal written in the sixteenth century. This statement, however, does not apply to the woodcut figures with which the book is illustrated. Whatever share may be claimed for our own country in the promotion of botanical studies during this period, it is clear that we contributed little or nothing to the history of the art of plant illustration as concerned with wood engraving. Nor can we lay claim to any original series of woodcut figures of plants in any preceding century. If we turn to Anglo-Saxon times and examine the figures in the manuscript versions of the " Herbarium " of Apuleius Platonicus—the most popular herbal in England at that period—we find that they are not original cuts drawn and engraved from Nature, but copies of a series of older figures, which are copies themselves of others older still. Their characters exhibit no trace of original work on the part of the Anglo-Saxon artists, and belong to the lowest period of Graeco-Roman or classical art. The first herbal printed in England with woodcut figures was the " Grete Herball " of 1526. The text of this, as already indicated, was a translation of the French work, " Le Grant Herbier," and the figures were inferior copies of those in the German works, " Herbarius zu Teutsch " and the " Hortus Sanitatis."

The next profusely illustrated English herbal was that of Turner, the complete edition of which, printed at Cologne in 1568, contained about 500 woodcut figures. These are markedly superior to those in the " Grete Herball." But the majority were not the work of an English artist, and for the originals we must go to the Continent, where, in 1530, a new era was inaugurated in the history of plant illustration by the publication of the great work of Otto Brunfels—" Herbarum vivæ eicones "—" living pictures of plants." These surpassed in a remarkable degree every other existing collection of plant figures, and were the work of an eminent engraver, Hans Weiditz, or Guiditius, who took for his models not the old conventional figures of the earlier copyists, but a new and original series drawn from the plants themselves with a beauty and fidelity that had never been equalled. But the culminating point in the history of plant illustration was reached twelve years later in the herbal of Leonhard Fuchs, " De historia stirpium," 1542, whose exquisite cuts were engraved by the eminent Strasburg engraver, Vitus Rudolphus Specklin, from drawings which faithfully depicted each plant with its own roots, leaves, flowers, seeds, &c. These

surpassed even those of Brunfels, and not only remained unsurpassed, but have never been equalled by any other collection.

Now when Turner published his herbal it would be quite natural for him to endeavour to secure the best collection of blocks available. These belonged to Fuchs, who had two sets, one for the folio edition of his herbal, and the other for the octavo edition of 1545. The blocks of the latter were evidently borrowed by Turner's printer, and of the 516 employed by Fuchs more than 400 were used in the complete edition of the herbal printed at Cologne in 1568. The advantage of securing the loan of these blocks was probably the chief reason why the book, like Lyte's translation of Dodoens, was printed abroad. But a number of Turner's figures were not taken from Fuchs. Of these a few were copied from the smaller figures of Matthiolus, but the source of the remainder I am unable to state. They were probably engraved from plants collected by Turner himself.

LOBEL'S HERBAL.

Matthias de L'Obel, after whom the garden flower Lobelia takes its name, was, like Dodoens, another Flemish herbalist who contributed to English botany. He was born in Flanders in 1538. After studying under Rondeletius at Montpelier, and travelling over various parts of the Continent, he settled at Antwerp, practised medicine, and became physician to William the Silent. About 1569 he crossed over to England, and resided with his son-in-law at Highgate, where he died in 1616. He held the appointment of superintendent of the physic garden belonging to Lord Zouch at Hackney, and received later the title of Botanist to James I. His first work, written in conjunction with Peter Pena, a Frenchman, who was at one time physician to Louis XIII, bears the following title :—

Stirpium Adversaria Nova, | perfacilis vestigatio, luculentaque accessio ad Priscorum, presertim | Dioscoridis et recentiorum, Materiam Medicam. | Quibus propediem accedet altera pars. | Qua | Coniectaneorum de plantis appendix, | De succis medicatis et Metallicis sectio, | Antiquæ e[t] nouatæ Medicine lectiorum remedioru | thesaurus opulentissimus, | De succedaneis libellus, continentur. | Authoribus Petro Pena & Mathia de Lobel, Medicis. |

Colophon.—Londini, 1571. | Calendis Januariis, excudebat prelum Tho- | mæ Purfœtii ad Lucretie symbolum. | Cum gratia Priuilegii. |

Underneath the title is a curious map of Europe and part of Africa,

and the whole is an excellent specimen of copper-plate engraving.
Like the complete edition of Turner and the herbals of Lyte and
Gerard, Lobel's work has a fulsome dedication to Queen Elizabeth.
Next comes a second dedication to the Professors of the University of
Montpelier, followed by a Latin index consisting of six leaves. The
text occupies the pages numbered 1 to 455, followed by an unnumbered
single leaf containing an account, illustrated on the verso by two wood-
cuts, of the Plocamos of Portland and the legend of the barnacle shells
producing wild geese.

The above volume forms the first part of the "Adversaria." The
second was not published till 1605, when a re-issue of the original
sheets of the first part with an entirely new title-page appeared with it.
This was erroneously regarded by Pulteney as a second edition. It
runs :—

"Dilucidæ | Simplicium Medicamenorum [sic] | Explicationes, | &
Stirpium Adversaria . . . | . . . | . . . | . . . | Authoribus Petro Pena &
Matthia de L'Obel medicis. | Quibus Accessit Altera Pars, cum prioris |
Illustrationibus, Castigationibus, Auctariis, Rarioribus aliquot Plantis.
| . . . | . . . | . . . | . . . | Opera et studio eiusdem Matthiæ de
L'Obel. | . . . | Londini, 1605. Idibus Aprilis. | Ex Topographia
Thomæ Purfootii."

On the back of the title are the Arms of James I, followed on the
next leaf by the dedication to the Montpelier Professors. The dedication
to Elizabeth is naturally omitted. The text of the work is made up
of the original sheets printed in 1570, with the exception of the last leaf,
which is reprinted, in inferior type on thinner paper, with a new colo-
phon, but without the two woodcuts. This will be referred to later.
The title of the second part begins :—

"Matthiæ de Lobel | . . . | . . . | . . . | . . . | Adversariorum Altera
Pars," | &c., &c. [*continued at some length*].

Above are the arms of James I. This second part follows the first
with a continuous pagination beginning on sig. Qq 2 (the new extra
leaf to the first part having the sig. Qq [i]) and ending on page 549.

From the bibliographical standpoint, the first part of the "Adversaria"
is of great interest. The irregularity in the printing of the last leaf
gave rise to the extraordinary statement by Pulteney that Christopher
Plantin of Antwerp, and not Purfoot, was the real printer of the work.
Such however was not the case, and in the interests of English printing
it is necessary to rectify this error, which has been copied by later
writers. On examining Purfoot's publication of 1605, consisting of the

first and second parts of the " Adversaria " (the first with the new title-page quoted above), preceded by another work of Lobel's—" Anim-adversiones in Rondeletii methodicam pharmaceuticam officinam "—he found that the first part of the " Adversaria " was notably superior to the rest of the volume, being printed in better type and on thicker paper. He therefore regarded it as a production of Plantin's Antwerp press, and the inference is that the last leaf bearing Purfoot's colophon, which was also printed with inferior type and on thinner paper, was added by Purfoot to give the work the appearance of one of his own publications. The fact that Plantin, in 1576, published another of Lobel's works, " Plantarum seu Stirpium historia," and appended the first part of the " Adversaria," precisely the same as that published by Purfoot in 1605, but with a new title-page and a different impression of the last leaf, was doubtless the foundation on which Pulteney based his statement. But why he should have overlooked the interesting extra leaf with Purfoot's colophon, which Plantin retained, it is difficult to say. It should have been quite obvious that Plantin would not have issued a work of his own with the colophon of another printer. However, the explanation of the whole affair is that Plantin, in his desire to append the " Adversaria " to Lobel's new work, purchased 800 copies of Purfoot's edition at the price of 1,200 florins, instead of printing the work afresh. To these he prefixed a new title-page bearing his own imprint, " Antverpiæ apud Christophorum Plantinum Architypographum Regium, M.D.L.XXVI." He also paid 120 florins for 200 of the 250 woodcut figures with which the work was illustrated. Considering the fame of Plantin's press, and the high standard of workmanship which he always maintained, the transaction is a compliment to London printing of that date.

Another interesting observation may be made with regard to the peculiar last leaf bearing Purfoot's colophon, which in the first edition of 1570 was unnumbered and evidently printed separately. It would appear that the number struck off was not large enough to complete all the copies of the " Adversaria " which remained after the sale of the first issue in 1570, plus the 800 impressions bought by Plantin in 1576. Purfoot, therefore, when he issued the remaining copies with a new title-page in 1605, would have to reprint the last leaf. And the absence of the two curious cuts representing the Plocamos of Portland and the legend of the barnacle shells is explained by the fact already stated that Plantin acquired the majority of his blocks in 1580. But these two particular cuts had evidently left his possession some time previously,

for they are to be found in the Antwerp edition of the " Plantarum seu Stirpium historia," of 1576.

Another book by Lobel, printed in England, was a fragment of a larger work which the author intended to publish under the title " Illustrationes Plantarum." Pulteney informs us that Lobel did not live to finish it, but How says it was completed. The fact remains that the work never appeared in its intended form. This fragment was edited under the following title by William How, a botanist and physician, and author of a work published anonymously on British Plants.

" Matthiæ de L'Obel | M.D. | Botanographi Regii eximii | Stirpium Illustrationes. | Plurimas elaborantes inauditas plantas, | subreptitiis Joh : Parkinsoni | rapsodiis (ex codice MS. insalutato) | sparsim gravatæ. | Ejusdem adjecta sunt ad calcem | Theatri Botanici | Αμαρτημαλα. | Accurante Guil. How, Anglo. | Londini, | Typis Tho : Warren, Impensis Jos : Kirton, Bibliopolæ, in Cœmeterio D. Pauli, | 1665."

Another part of the manuscript was purchased by Parkinson, who embodied it in his " Theatrum Botanicum " of 1640. As will be seen later, from the title of his work, Parkinson did not attempt entirely to conceal this fact, but he did not adequately express his indebtedness by showing to what extent he had drawn on these papers of Lobel. For this he is severely criticized by How, who complains of his action in taking many of Lobel's observations and expressing them as his own.

Lobel's Illustrations.

One cannot close an account of Lobel's works and those of his contemporaries, Dodoens and Clusius, without observing not only how far their studies contributed to the history of the herbal in England, but also the proud position which their figures occupied in the history of botanical illustration. Lyte's important work, which ranked as a popular English herbal, was a translation of Clusius's French version of Dodoens' " Cruydtboeck," and it will be seen later that Gerard's herbal was in the main a translation of the final work of the same writer. Lobel's " Adversaria," on account of its being printed and published in London, and on account also of the author's close association with the study of botany in this country, can also be classed as an English herbal. But the popularity of these writers in their own country was due in no small degree to the zeal of the eminent printer,

Christopher Plantin, at whose expense the large collection of beautiful woodcut figures which illustrated their later works were either engraved or got together. The blocks are preserved to this day, and may be seen by any visitor to the famous Plantin Moretus Museum at Antwerp. Owing to its being written in Latin, Lobel's " Adversaria " did not attain in this country the popularity enjoyed by Turner's herbal and Lyte's English translation of Dodoens.

Concerning the figures which were used to illustrate the first and second parts of the " Adversaria " printed by Purfoot, there is little to be said beyond the fact that the majority were purchased by Plantin and added to the large collection of figures which he gathered together and subsequently published separately. Many served to illustrate the " Cruydtboeck " of Dodoens published by Plantin in 1581, and also the work published in the same year, " Plantarum seu stirpium icones "— a collection consisting of all the woodcut figures of plants in Plantin's possession at that time. These numbered 2,181, the same number I believe which the Cruydtboeck contained. This collection was printed again in 1591. Both are arranged according to Lobel's scheme of classification—a scheme upon which his fame as a botanist chiefly rests. Plantin's edition of the " Plantarum seu stirpium historia," 1576, has been described as an enlarged edition of the " Adversaria." But this statement, which carries the inference that additions were made to the text itself, requires modification. Plantin's publication consisted of two distinct, although supplementary, parts, the first of which has the running title " Stirpium Observationes." The second part consists of the text of the " Adversaria," containing about 270 to 280 woodcuts, printed by Purfoot himself in 1570, in precisely the same state in which Purfoot issued it, without alterations or additions. Plantin simply added the work (with a new title-page and " Royal Privilege ") to his own publication. Hence the title—" Plantarum seu stirpium historia. . . . Cui annexum est Adversariorum volumen." It cannot therefore be described simply as an enlarged edition of the " Adversaria." Nor would it be correct to state that the large Flemish " Kruydtboeck," consisting of upwards of thirteen hundred pages, and more than two thousand woodcuts, is merely a translation of Purfoot's edition. It is even much larger than the work of 1576, consisting of the " Stirpium Observationes " and the " Adversaria," the former of which contains about 1,470 figures. These figures have been regarded as derived from previous books, especially those of Clusius, but this statement also requires modification. About half were taken from the editions of

Dodoens and Clusius, but no less than 782 were expressly engraved for
the work, the greater part by Antoine van Leest, and the remainder
by Gerard van Kampen.

<div align="center">LYTE'S HERBAL.</div>

Eight years after the publication by Purfoot in 1570 of the
" Adversaria " of Lobel, there appeared the fine folio in English popularly
known as " Lyte's Herbal." This was not the work of an original
English botanist, but a translation of the French version by Charles de
l'Escluse, 1557, of the Flemish Herbal or " Cruydtboeck " of Rembert
Dodoens, published at Antwerp, 1554. Dodoens, although not an
Englishman, has a special claim to remembrance in the history of
English botany, as his Cruydtboeck in Lyte's translation was well
received in this country, being considered, in the matter of arrange-
ment, superior to the work of Turner. It was naturally more popular
than that of Lobel, which was in Latin. His great herbal, " Stirpium
historiæ pemptades sex," in which were gathered all his writings on
this subject, together with the additional matter he had accumulated,
became, as we shall see later, the foundation of the most popular of
English herbals, that of Gerard, 1597. Like Turner and most of his
contemporaries of the botanical Renaissance, Dodoens was conspicuous
for his learning and attainments. The foremost botanist of his own
country, he was born at Malines about 1517, and after studies at
Louvain and the universities and medical schools of France, Italy, and
Germany, he graduated M.D., and became physician to the Emperors
Maximilian II and Rudolf II. Later he was Professor of Medicine
at Leyden. His interest in the science of botany, and the opportunities
he enjoyed for its study, made him one of the. most industrious of
European botanists, as is evident from the various works he published.
Lyte's chief claim to remembrance does not lie in any originality in
connexion with the book, but in the service he rendered English botany
by his translation of this important work.

Title.—A Niewe Herball | or Historie of Plantes : | wherin is con-
tayned | the whole discourse and per- | fect description of all sortes
of Herbes | and Plantes : their diuers & sundry kindes : | their straunge
Figures, Fashions, and Shapes : | their Names, Natures, Opera-
tions, and Ver- | tues: and that not onely of those whiche are | here
growyng in this our Countrie of | Englande, but of all others also of
forrayne Realmes, commonly | used in Physicke. | First set foorth in
the Doutche or Almaigne | tongue, by that learned D. Rembert Do- |

doens, Physition to the Emperour : | And nowe first translated out of French into English, by Hen- | ry Lyte Esquyer. | At London | by me Gerard Dewes, dwelling in | Paules Churchyarde at the signe | of the Swanne. | 1578.

Colophon [*Printer's mark*].—Imprinted at Antwerpe, by me | Henry Loë Bookeprinter, and are to be | solde at London in Powels Church-yarde, | by Gerard Dewes.

The title is surrounded by an elegant woodcut border on which are figures of Apollo, Gentius, Mithridates, Aesculapius, Artemesia, and Lysimachus. The lower part represents the Garden of the Hesperides. The whole seems to have been taken from the original Cruydtboeck of 1554 and Clusius's French version of 1557, but an ornament of flowers at the top has taken the place of the coat-of-arms on the original block. On the verso of the title-page is Lyte's coat-of-arms, and a crest " a swan volant silver upon a trumpet gold." On the recto of the second leaf begins the dedication to Queen Elizabeth, followed, on the recto of the third, by an address " To the friendly & indifferent Reader." On the verso of this begin the commendatory verses addressed to Lyte by W.B., Thomas Newton, Wm. Clowes, and John Harding, and on the verso of the sixth is a woodcut portrait of Dodoens, whose preface and epistle to the reader, both in Latin, together with the appendix, follow on the recto of leaves seven, eight, and ten respectively. The last leaf carries the colophon and printer's mark of Henry Loë. The work is in black letter, and, considering the workmanship of the period, forms a handsome volume.

Lyte's translation, like the original, is divided into six books, and contains descriptions of about 1,050 species. This is an increase on the number in Turner, to whose work it is superior in the matter of arrangement—the species, descriptions, places, names, and medicinal virtues being reduced in the various chapters to a particular order which was followed by Gerard and Parkinson. The cuts also exceed those in Turner by nearly 400. As Clusius's French version contained numerous corrections and additions, Lyte's translation may really be regarded as a second edition of the original work.

Lyte's Illustrations.

The first edition, 1578, was printed at Antwerp in order to make use of the woodcut figures which were then in the hands of the Antwerp printer, and also, presumably, in order that Dodoens himself could

keep in touch with the publication. On account of the title-page bearing the imprint " at London, by me Gerard Dewes," the work is sometimes referred to as a production of a London press, but this is not correct. Dewes's association with the book was that of publisher or bookseller, and the printing, as the colophon indicates, was carried out by Henry Loë at Antwerp. The figures have also been spoken of erroneously as having been acquired by the supposed London printer, and that Dodoens consequently met with considerable difficulties in his desire to publish his work in Latin. But as the work was not printed at London, the blocks never came to this country. They remained at Antwerp, and three years later were sold by the widow of Jean van der Loë to Christopher Plantin for the sum of 420 florins. Plantin used them, together with others which had been employed for the earlier works of Dodoens, Clusius, and De Lobel, for the great Latin herbal of 1583. This fact explains the reason why the later editions of Lyte's book, all printed at London, were published without figures.

Lyte's first edition contains about 870 cuts, and probably all of these, with the exception of thirty which are said to be new, were from the same blocks as were used for Clusius's translation, a large number of which were employed previously for the octavo editions of Fuchs's collection, 1545. Dodoens himself acknowledges that almost all the figures in his first edition were taken from Fuchs. But it would not be correct to state, as is generally supposed, that the figures in Lyte's edition were nearly all taken from Fuchs. Those in Lyte number about 870, whereas the cuts in Fuchs do not exceed 516. Nearly 360 therefore do not belong to Fuchs. These, or the greater part of them, were collected by Dodoens himself and employed for three other works which he published in 1563, 1568, and 1574, subsequent to the original edition of the Cruydtboeck in 1554, and prior to Lyte's translation of 1578. Whether the thirty in Lyte which are said to be original were executed for Lyte himself or not, I am unable to state. I should say they were probably supplied by Dodoens, who, in the interval between the publication of Clusius's French version and the English translation of 1578, had been hard at work collecting new figures and materials which he embodied in the three other works just mentioned. In the verses "in commendation of the work" by Thomas Newton at the beginning of the book there are indications that Dodoens was interested in the publication.

Great was his toyle, whiche first this worke dyd frame.
And so was his, whiche ventred to translate it,
For when he had full finisht all the same,
He minded not to adde, nor to abate it.
Till *Rembert* he, did sende additions store,
For to augment Lytes travell past before.

Three other editions of Lyte's translation were printed at London by Ninian Newton, 1586; Edm. Bollifant, 1595; and Edward Griffin, 1619. The titles are long and closely follow the first edition of 1578. Being without illustrations, they are of little importance, and it has not been thought necessary to reproduce them. Other editions are stated to have been published in 1589, 1600, and 1678, but no trace of these can be found.

A book purporting to be an abridgment of Lyte's translation appeared in 1606 under the title beginning: "Rams little Dodeon. A briefe Epitome of the new Herbal," &c. It is nothing more than a book of recipes, unworthy of being associated with the name of Dodoens.

GERARD'S HERBAL.

The most popular of all the English herbals was that of John Gerard (1545-1612). Gerard studied medicine, and in 1562 was apprenticed to Alex. Mason, a surgeon, twice warden of the Barber Surgeons' Company. He was admitted to the freedom of this company in 1569, appointed junior warden in 1597, and elected master ten years later. Although Gerard evidently attained some eminence as a surgeon, he is better known as a botanist or herbalist. For the study of plants he had the most favourable opportunities, being superintendent of Lord Burleigh's gardens in the Strand, and at Theobalds, in Hertfordshire. He also had a garden of his own in Holborn, and published a catalogue of the plants it contained in 1596. The first edition of his herbal has the simple title :—

The | Herbal | or Generall | Historie of | Plantes. | Gathered by John Gerarde | of London Master in | Chirurgerie. | Imprinted at London by | John Norton. | 1597 |

Colophon.—Imprinted at London by Edm. Bollifant, | for Bonham & John | Norton M.D.XCVII.

The title is in the middle of a fine copper-plate engraving of floral and figure design, showing four mythological male figures holding plants. Underneath is a garden. On the back of the title are the arms of Lord Burleigh, to whom the work is dedicated on the next

leaf.   The following eight preliminary leaves consist of laudatory letters
from Lancelot Browne, Matthias de L'Obel, Dr. Stephen Bredwell,
the Royal Surgeon, George Baker, and Gerard's own preface to the
" courteous and well-willing Readers."   Among them (B i to B 3 recto)
are some verses.   On the verso of the tenth leaf is a portrait of Gerard
holding a branch of the potato plant.   Underneath are his own arms,
those of the City of London, and the Company of Barber-Surgeons.
The whole work consists of 742 leaves or 1464 pages, the text occupying
pages numbered 1 to 1392.

The most interesting point in connexion with this massive work is
perhaps that which concerns its authorship.   It is a matter that does
Gerard little credit.   Towards the end of the sixteenth century, it
appears that the London printer Norton wished to bring out a trans-
lation of the great Latin herbal of Dodoens.   He thereupon employed
Dr. Priest to undertake the work, but either immediately before or after
the translation was completed Dr. Priest, it is said, died, and Norton
engaged Gerard, who at that time had a considerable reputation as a
herbalist, to put the finishing touches to the work.   From a fact which
I have not seen recorded by any of Gerard's biographers—namely, that
he held the appointment of curator of the physic garden belonging to
the College of Physicians—I suspect that he was well acquainted with
Dr. Priest, who was a Fellow of the College, and had a part in the
preparation of the Pharmacopœia.   It would not be unreasonable to
suppose, therefore, that Dr. Priest took Gerard into his confidence and
consulted him on various points in connexion with the work.   In any
case Gerard was probably acquainted with it, from the fact that he
gained possession of the manuscript.   But the discreditable part of the
whole affair is that Gerard, in order that the work should not appear to
be a translation, altered the whole arrangement and claimed it as a
work of his own.   The story is to be found in Johnson's preface to the
edition of 1633, where he blames Gerard for " endeauouring to hide this
thing from us, cauilling (though commonly unjustly) with Dodonæus
whersoever he names him."   What has been regarded as a somewhat
remarkable oversight on the part of Gerard in allowing it to appear is a
statement by Dr. Stephen Bredwell in his letter to Gerard, prefixed to
the herbal, that " Dr. Priest for translating so much as Dodonæus hath
hereby left a tombe for his honourable sepulture.   Mr. Gerard comming
last, but not the least, hath many waies accomodated the whole worke
unto our English Nation."   " But that," says Johnson, " which may
serue to cleare all doubts, if any can be in a thing so manifest, is a

place in Lobel's Annotations upon *Rondeletius* his Pharmacopœia, where *page* 59 he findes fault with Dodonæus for using barbarously the word *Seta* for *Sericum*; and with Dr. Priest, who (saith he) at the charges of Mr. Norton translated Dodonæus, and deceiued by this word *Seta*, committed an absurd errour in translating it a bristle, when as it should haue been *silke*. This place so translated is to be seen in the chapter of the Skarlet Oke, at the latter F. And Lobel well knew that it was Dr. Priest that committed this error, and therefore blames not Mr. Gerard, to whom hee made shew of friendship, and who was yet liuing : but yet he couertly gaue us to understand, that the works wherein that error was committed, was a translation of Dodonæus, and that made by Dr. Priest, and set forth by Mr. Norton."

Gerard's herbal, then, is in the main the " Pemptades " of Dodoens translated, " so that diuers chapters haue scarce a word more or lesse than what is in him." A few plants were taken from Clusius, and others from the " Adversaria," while fourteen were original descriptions. " The volume has many of Gerard's own remarks inserted, such as localities in various parts of England for scarce plants, and many allusions to persons and places now of high antiquarian interest. He lays claim to a purely scientific object, but accepts much contemporary folk-lore." The legend of the barnacle shells may be cited as an example, but this is scarcely to be wondered at when we remember that Turner himself was deceived by the fable. " His chief commendation," thought Johnson, " was that out of a propense good will to the public advancement of this knowledge he endeavoured to perform there in more than he could well accomplish, which was partly through want of sufficient learning." Johnson, nevertheless, exhorts his readers to think well of Gerard, and not blame him for these defects, seeing that he was wanting neither in pains nor goodwill to perform what he intended. But whatever credit may be due to Gerard, he certainly cannot be commended for his disingenuous remarks in relation to Dr. Priest's translation. In his own preface he writes : " Dr. Priest, one of our London Colledge, hath (as I heard) translated the last edition of Dodonæus, and meant to publish the same; but being prevented by death, his translation likewise perished."

A second edition was brought out, amended and corrected, by Thomas Johnson in 1633 :—

" The | Herball | or Generall | Historie of | Plantes. | Gathered by John Gerarde | of London Master in | Chirurgerie | Very much En-larged and Amended by | Thomas Johnson | Citizen and Apothecarye | of London."

The title occupies the centre of a beautiful copper-plate engraving. At the top are figures of Ceres and Pomona, with a garden between them. In the middle are figures of Theophrastus and Dioscorides, one on each side of the title. At the bottom is an ornament of flowers and herbs in each corner, and between these a portrait of Gerard—a reduced copy of that in the first edition. The preliminary leaves contain the dedications of Johnson and Gerard, the laudatory letters of Lancelot Browne, Matthias de L'Obel, Dr. Stephen Bredwell, and Surgeon George Baker. Among them are Latin verses. Then follow addresses to the readers by Gerard and Johnson, and a catalogue of Johnson's additions. Johnson's address consists chiefly of a long and important account of herbal literature from the earliest times. This edition is much superior to, and more accurate than, Gerard's first edition of 1597, and was so well received that it was reprinted practically word for word three years later, the only alterations being the errata of the previous edition. The editor, Thomas Johnson, was a very able botanist, and a prominent member of the Apothecaries' Company. Partly on account of his learning, he was made M.D. by the University of Oxford in 1643, in which year he published a translation of the works of Ambroise Paré. To his edition of the herbal, which contains about 2,850 descriptions, he added more than 800 new species, and about 700 new figures, besides numerous corrections. Ray gave it the name " Gerard emaculatus," and by Haller it was styled " dignum opus, et totius rei herbariæ eo ævo notæ compendium."

Gerard's Illustrations.

Gerard's cuts in the first edition of the work are the subject of some interesting remarks. With the exception of sixteen, they were not original. That is to say, they were not the work of any English artist, or engraved specially for the work. When the herbal was published in 1597, there was no English collection of blocks in existence, and Gerard, like his predecessors Turner and Lyte, was obliged to have recourse to one of the large series of figures which illustrated the herbals printed on the Continent. As Gerard's book was mainly a translation of the final edition of Dodoens, it would be quite natural to suppose that he would obtain the illustrations from the same source, but as all the figures which Dodoens used, together with those employed for the other Flemish herbals, were in the possession of Plantin at Antwerp, and as Gerard took pains to disguise the fact that his work was mainly a trans-

lation, it is probable that he had no particular desire to obtain the loan of these. Fuchs's collection, which Turner used, only contained about one-third of the number required, and would not serve Gerard's purpose. Norton, his publisher, thereupon applied to Nicolaus Bassæus, of Frankfurt, and obtained the loan of the blocks with which the herbal of Jacob Theodor of Bergzabern (or, as he is commonly called, Tabernæmontanus), was illustrated. This work, the "Neuw Kreuterbuch," appeared, the first part in 1588, and the second in 1591, but the figures, which exceeded in number those of Plantin's collection, were published separately in 1590 under the title "Eicones Plantarum." They were, however, not entirely original, and the majority were copied from the herbals of Lobel, Dodoens, Clusius, Fuchs, Matthioli, and Bock. It is thus obvious why so many of Gerard's figures closely resemble corresponding cuts in the works of those authors. Gerard did not make use of all these blocks, as those in his herbal number about 1,800 against some 2,200 in Tabernæmontanus. Of the 1,800, only sixteen are said to be original.

But the interesting point about these figures is that Gerard's knowledge of botany was not sufficient to guard him against the numerous pitfalls which their application to his descriptions presented, and the confusion which ensued exposed him to Johnson's charge that he endeavoured to perform therein more than he could well accomplish, which was partly through want of sufficient learning. It also transpires that Lobel was asked to correct his errors, but the assiduity with which Lobel complied with this request was such that Gerard stopped the process, and with bad grace accused him of having forgotten his English. Johnson tells us that Gerard had no great judgment in these figures, and "frequently put one for another, and, besides, there were many plants in those authors which he followed, which were not in Tabernæmontanus and divers in him which they wanted, yet he put them all together, and one for another, and oft times by this means so confounded all that none could possibly have set them right, unless they knew the occasion of these errors."

The cuts in Johnson's edition number, according to Pulteney, about 2,717, upwards of 700 of which are said to be new, but I have not compared the two editions. Pulteney says that Johnson procured the same cuts that Gerard borrowed, but Johnson himself, in his preface, tells us that he made use of "those wherewith the works of Dodonæus, Lobel, and Clusius were formerly printed." If so, they must have been lent by Plantin at Antwerp. I have compared a number in Johnson

A—15

with corresponding cuts in Plantin's issue of Lobel's "Kruydtboeck," 1581 (which is supposed to have contained all the figures in Plantin's collection at that time), and judge them to have been printed from the same blocks. Plantin's printed collection numbered 2,181, which leaves about 536 to be accounted for. Whether or not these were also borrowed of Plantin, who in the interval had doubtless collected new figures, I am unable to say. The frequency with which the large collections of figures were either borrowed or copied makes a comparison very perplexing, and the issue is not important enough to warrant the large amount of time which such an undertaking would necessarily entail. Suffice it to say that Johnson's edition contained the largest number of cuts of any herbal extant.

PARKINSON'S HERBAL.

The last of the old English herbalists was John Parkinson, born in 1567, and died in 1650 at the ripe old age of 83. Like Turner, Johnson, and Gerard, he had a garden of his own containing many rare plants. Parkinson was apothecary to James I, and in 1529, upon the publication of his "Paradisus Terrestris," dedicated to Queen Henrietta Maria, he was styled by Charles I "Botanicus Regius Primarius." The "Paradisi in Sole Paradisus Terrestris: A Garden of all Sorts of Pleasant Flowers," &c., was his first work. A second edition was published six years after the author's death in 1656, and a facsimile reprint of the first edition has appeared during the last few years—an honour which has not been shared by any of the herbals, and an indication of the esteem in which the curious old sixteenth-century book is held in modern times. The work, however, does not concern us. It is merely a book for the gardener or florist, and does not come within the meaning of the term "herbal."

Parkinson's herbal, upon which he spent the greater part of his life, is a massive folio volume with the title :—

"Theatrum Bo- | tanicum : | The Theater of Plants. | Or, | An Herball of | Large Extent : | Containing therein a more ample and | exact History and declaration of the Physicall Herbs | and Plants that are in other Authours, encreased by the accesse of | many hundreds of new, rare, and strange Plants. . . . Shewing withall the many errors, differences, and | oversights of sundry Authors that have formerly written of | them. . . . Distributed into sundry classes or Tribes, . . . with the chiefe notes of *Dr. Lobel, Dr. Bonham,* | and others inserted

therein. | Collected . . . by *John Parkinson* Apothecary of *London*, and the | Kings Herbarist. | And Published by the Kings Majestyes especiall priviledge. | London, | Printed by Tho. Cotes. 1640." |

The above is preceded by a fine copper-plate engraved frontispiece, with a shortened form of the title in the middle. On the left is a figure of Adam, and on the right, one of Solomon. There are also four other mythological figures, and at the bottom of the page is a portrait of the author. Following the title is Parkinson's address to the reader. Then comes the dedication to Charles I and the customary commendatory pieces in Latin and English. The rest of the work consists of 1,755 pages.

This is the largest of all the English herbals, the number of plants described exceeding those in Johnson by nearly 1,000, being almost double the number in Gerard's first edition. Altogether the descriptions approach 3,800. The title originally intended for the work was a "Physicall Garden of Simples," but Parkinson's incursions into the by-ways of botany, like those of his predecessors, were not easy or uneventful, and as time went on he changed the plan to comprehend a larger scheme. At the beginning of his preface he complains "that disastrous times, but much more wretched and perverse men have so farre prevailed against my intended purpose, and promise, in exhibiting this worke to the publicke view of all, that their extreame covetousnesse had well nigh deprived my country of the fruition." It was Parkinson's professed design, Pulteney tells us, " to make his work a *Materia Medica* ; and if, in him, we meet with the qualities of plants estimated on Galenical principles, by the degrees of hot and cold, moist and dry, &c., it was the theory of the day, from which authors of higher eminence were not emancipated. He not only gives the opinions of the Greek and Roman physicians, but of the Arabians, and has translated from the moderns, and his contemporaries, whatever could illustrate his subject, and render it as perfect as the intelligence of the times would allow."

The ponderous volumes of Gerard and Parkinson have been described as the two main pillars of botany in England till the time of Ray. It is to be feared, however, that Gerard's work remained the more popular of the two on account of the superiority of his figures, but his learning and natural qualifications for the work do not appear to have equalled those of Parkinson, whose herbal was much more original. The papers of Lobel, which Parkinson purchased and incorporated into his work, have already been referred to under the name of that author. How accused Parkinson in rather bitter terms of making Lobel's observations his own,

without expressing adequate acknowledgment, but it was Pulteney's opinion that whatever may have been the case in particular instances, the attack on the whole was uncandid.

Parkinson's Illustrations.

The text of Parkinson's first work, " Paradisus Terrestris," does not concern us, as it partook of the nature of a gardening book rather than that of a herbal. But in one particular respect it shares an interest common to all the herbals of the period—namely, that of botanical illustration. The woodcut figures which illustrate the work, although occupying no important place in the history of the art, unless it be that which marks its decline, are worthy of consideration. By this time the old wooden cuts which had given these herbals an artistic interest of the highest importance were being rapidly superseded by engravings on metal. Our own country, compared with Germany, Italy, and the Netherlands, had added little to the general history of the herbal, and to the art of botanical illustration it had contributed less. Turner's, Lyte's, and Gerard's figures were almost all of German or Flemish origin, but in Parkinson's " Paradisus," although many were copied from Clusius and Lobel, the majority were probably original. All were cut afresh, and were the work of an English engraver. On this account they are worthy of attention, although from the artistic standpoint they are of no importance. The figures in the " Theatrum " were mostly copies of those in Johnson's edition of Gerard, but less in number by about 100. Like those in the earlier work, they were all newly cut.

CONCLUSION.

With the publication of Parkinson's " Theatrum " in 1640, the period of the old English herbal ended. The works of the well-known writers, Nicholas Culpeper and William Cole, published within the next twenty years, are not included. It may also be necessary to state why the writings of the great British botanists, Morison, Ray, Grew, and others, are not described. With regard to these latter it must be observed that they were botanists in the more scientific sense, rather than herbalists, and that by the time their books appeared, the science of botany had grown up to an independent position and was no longer a branch of medicine. After this period, the popularity of the herbal declined, and on account of the great revolution in botanical studies

the large number of herbals which have appeared since Parkinson's day are of little or no importance.

Concerning Culpeper and Cole, who were industrious exponents of astrological botany and the doctrine of signatures, little need be said. Their works only tend to bring the literature of herbals into disrepute. Astrological botany—a belief in the influence of the moon and stars upon plants—goes. back to ancient times, and it is, perhaps, a measure of Culpeper's quality that he revived this absurd superstition when the learned herbals of the scholar physicians and botanists of the Renaissance had done so much to raise the herbal above such false and engrossing beliefs. According to the doctrine of signatures, many medicinal herbs indicated by some external characteristics the diseases for which they were remedies. With regard to this doctrine, it is perhaps only necessary to add that the late Dr. Paris regarded it as " the most absurd and preposterous hypothesis that ever disgraced the annals of medicine." It is not claimed, however, that the learned herbalists, whose works form the subject of the latter part of this paper, were entirely free from superstition. They were not, but with the doctrine of signatures and astrological botany they had little to do, and their works contain many definite refutations of various superstitions. Their works must be judged, not in the light of twentieth-century standards, but by a comparison with their contemporaries and predecessors.

For the loan of the old herbals exhibited when the abstract of this paper was read my thanks are due to Mr. Bernard Quaritch and the Master of the Society of Apothecaries. English works only form a short chapter in the general history of the herbal, and to those who desire a survey of the whole range of this fascinating literature during its best period the recent book by Mrs. Arber (Cambridge University Press)— the only modern English work on the subject—is recommended.

apoplexy and restore speech lost. Dose, from three drachms to an ounce."

Remedies such as *Aqua Mirabilis* were appropriately called "*Polychrest*" (Πολύχρηστος) having "manifold or almost general virtues." One of these is introduced with much parade in Lady Sedley's book as :—

"A copy to make the sóvreigns't water that ever was devised by man, which Dr. Stephens a physician of great cuning and of long experience did use and therewith did many great cases, and all was kept in secret until a little before his death, when the Archbishop of Canterbury got it from him as follows :—

"Take a gallon of Gascoyn wine, then take Ginger, Galingall, Camell, Cinamint, Tollianders, Nutmegs, Cloves, Aniseed, of each one drahm, then take Sage, Mint, Red roses, Thyme of the moor, Pellitory of the wall, Rosemary, Wild Marjorum, Pennyroyal, Thyme, Lavender and Avens" (Caryophyllata). All these were to be bruised together and distilled in a limbeck.

"The virtues of this water be these : It conforteth the spirits vitall, and preserveth greatly the youth of man, and helpeth the inward diseases coming of cold, and against shaking of the palsy, it cureth the contraction of the sinewes, it helpeth the conception of women that be barren, it killeth wormes in the body, and killeth the cold gout, and helpeth tooth-ache, it comforteth the stomach very much, it cureth the cold dropsy, it helpeth the stone that is in the bladder, and in the reines of the back : it cureth the canker, it helpeth shortly a stinking breath, and whosoever useth this water ever and anon, and not often, it preserveth him long in good liking, and shall make one seem young a long time."

With such "polychrest" remedies as these in hand, one wonders why others should be sought. Dr. Stephen's water (Aqua Stephani) was incorporated in Salmon's Dispensatory, 1696, and also in Quincy's "Complete English Dispensatory," 11th edition, 1739, as "a cephalic, a Cordial and Carminative, and likewise something Hysterical, if the Penniroyal be left out." Dr. Stephens died aged 98, shortly after the Restoration of Charles II. He was the author of the "Catalogue of the Oxford Botanical Gardens."

We find in Lady Sedley's book formulas by well-known physicians, including Sir Thomas Witherley, Dr. King, Dr. Greaves, Richard Lower, Dr. Hintent and the great Sydenham himself. Witherley, King and Lower attended Charles II in his last illness, and King was the physician who, Evelyn says, "with extraordinary dexterity, resolution and presence

of mind, at once bled his Majesty, or he had instantly died that moment." The Privy Council ordered him £1,000 for his promptness, which, however, he never received, probably because doubts were soon entertained as to the correctness of the treatment and the diagnosis of apoplexy on which it was based.

Dr. Raymond Crawfurd has recently discussed the problem, and concludes that Charles II died of uræmia ("Last Days of Charles II"). King's treatment was therefore not inappropriate at the onset, but, unfortunately, it seems to have been carried out subsequently with more zeal than discretion, and may have accelerated death. Macaulay's charge that the physicians "tortured him for some hours like an Indian at the stake" is not unwarranted when one reads of the repeated venesections, the "vomits and purges, the cantharides blister 'universo capiti'"; the Burgundy pitch plasters to the soles of the feet, and other forms of drastic medication which were employed.

Dr. King's prescription for "The griping of the Gutts" adopted by Lady Sedley is simple: "Take a penny loaf, and slitt it, and toast it, and spread it over with Venice Treacle, and dip it in sack boyled with cloves, cinnamon and nutmeg, tye it up in a cloath, and lay it to the navel."

At this period medicaments were thought to find a ready way to the intestines *per umbilicum*, and vermifuges were commonly applied to the navel instead of taken internally.

Sir Thomas Witherley supplies Lady Sedley with an "ale" and "Dyett drink for the Gout": "Take six or seven gallons of Wort made of a bushell of Malt, put to them a handfull of Hopps, boyle these herbs an hour, then infuse in them the shavings of Sassafras and Guaiacum of each 2 oz., Liquorice an oz., Raysins stoned 2 oz., Ground Ivy, Ground Pine, Sage and Germander of each two large handfulls, boyle these with a very gentle fire close covered up untill a gallon wast, when it is cold straine it and work it up with yest, and keep it in a fitt vessel having in the vessel in a bag a pound of Antimony in powder. After 4 to 5 days you may draw it into bottles and drink it for your comon drink." It is not stated whether the addition of antimony was designed to produce an emetic effect.

Dr. Jacob, of Canterbury, contributes as medicine for the stone "15 grains of Goate's blood in powder dranke every morning in Asses' milk or other milk." He was seemingly unaware that thirty years previously Sir Thomas Browne in his "Pseudodoxia Epidemica" had exploded the fallacy that goat's blood is lithontriptic. Dr. Jacob's other recipe

is for " giddiness of the head." It consists of powder of male peony root, powdered peacock's dung and nutmeg, of each ½ oz. As much as would lie on a sixpence was to be taken in four spoonfuls of black cherry water. All these remedies were regarded as cephalics and specifics for giddiness and the " falling sickness." The practice of supplying children with necklaces made of dried peony root and henbane to protect them from convulsions was recommended in the 1739 edition of " Quincy's Dispensatorie," but is not mentioned in the edition of 1746.

Sir Edward Greaves, who had the distinction of being the first physician to be created a baronet, supplies a " Receipt for Convulsion Fitts," consisting of peony roots, dead man's skull, hoofs of asses, white amber and bezoar made into a julep or emulsion. Bezoar stones were concretions found in the stomach of the Capricervus, orientalis and occidentalis, or " deer goat," and were accounted excellent for vertigoes, epilepsies, megrim, and in fact for nearly all diseases. They were equally efficacious as amulets or as internal remedies.

The great Sydenham's " Prescription for the head " illustrates his teaching : " The more numerous the simples the more potent the medicine," for he adds Roman wormwood, orange peel, angelica and nutmeg to Venice treacle, which already contained seventy-two ingredients. But the dose was only the quantity or ' bigness' of a nutmeg, and was directed to be washed down with a diuretic draught containing horseradish, elecampane, garden scurvy grass, white horehound, tops of Roman wormwood, centaury, broom, chamomile flowers and juniper berries infused in five pints of sack.

" Dr. Lower's receipt for ye Scurvey " is simple and unpretending : " Take a pound and a half of Dock roots, three handfulls of Hart's tongue, four handfulls of Dandelion roots, put them in a bagg to 4 gallons of small ale." Richard Lower was the eminent anatomist who is supposed to have played the part of " ghost " to Thomas Willis in preparing his work on the brain.

There are four other prescriptions for scurvy in the Sedley book, two of which are a distinct improvement on Lower's, for one contains twelve lemons sliced thin in addition to the juice of scurvy grass, brooklime, watercresses, briony, horseradish and nutmegs, the whole to be infused in 8 pints of Rhenish wine. Three spoonfuls were to be taken night and morning, and " you must abstaine from all salt meat, swineflesh, butter and wine." The other prescription (Sir Thomas Witherley's) includes orange and lemon peel, and 4 oz. of orange juice.

Three other prescriptions are preservative against plague and pesti-

· lence. Two of them are guaranteed " by God's help to protect against plague for the span of a whole year " if taken for nine days and nineteen days respectively. They are chiefly remarkable for the large quantities of ginger which they contained. This, no doubt, imparted a sensation of cheering warmth to the epigastrium of those who were panic stricken at the approach of plague, and thus assured them that protective agents were at work on their behalf. Recently I was told of a practitioner who during the cholera scare prevalent in the late " eighties " achieved great renown by supplying an " anti-cholera mixture " containing chiefly cardamoms, capsicum and ginger, to his patients. Another " most sove-raigne and approv'd Preservative above all others for the purging away of the plague " is by one M. D. Hintent. It consisted merely in the formation of an issue on the inner side of the left arm, half way between the wrist and the elbow.

There are two prescriptions for rickets, a disease first described by Whistler in 1645, and five years later by Glisson. Glisson attributed rickets to ill-health, delicacy or indiscretion on the part of the mother during pregnancy, and to feeding the child on a cold moist diet, such as melons and cucumbers, or on crude and oily substances such as fish, salt meat, butter and cheese, with excess of confections, spices and pickles ; air, cold and moist, or very warm and relaxing ; too much exercise or not enough ; too frequent bathing in warm water ; the use of oily relaxing liniments, and too soft linen, especially if moist, were contributing causes. His treatment aimed at correction and gentle evacuation of the " morbific matter " by means of laxatives, clysters and very mild emetics. Incidental symptoms such as " rheums," gripes, worms and teething received attention, and he accounted about thirty herbs, roots, and simples as " Specifics " for the disease, besides flowers of sulphur and preparations of steel. He also applied strengthening ointments and liniments to the joints and limbs, and used exercises and splints to correct deformities.

Lady Sedley's prescriptions for " ricketts " are but gleanings from Glisson, apparently designed to meet all the complications as well as the symptoms of the disease itself. Both are " Dyett drinks " containing figs, raisins, currants ; herbs such as betony, egrimony, hart's tongue, liver-wort, colt's foot, scabious, parsley, water cress, cumfrey and liquorice. But the menstruum of one is " faire water," and of the other " strongest ale," three quarts evaporated to half its bulk, and with half a pint of muscadine added thereto. " You must give the child 2 spoonfulls in the morning fasting, 2 after dinner when it goes to sleep, and 2 at

night going to bed. This is to be continued till the quantity be all •
taken." The remedy was certainly calculated to induce sleep, but it
may be hoped that the aqueous infusion was more in general use than
the alcoholic. If we may judge from a letter of about this period, or a
little later, concerning Prince James, son of James II, dandling or
bouncing the child up and down was regarded as an essential part of
the treatment for rickets.

"The royal Prince " (James, son of James II) " is in best of health
and grows more beautiful every day. I . . . . feel regret at seeing the
manner of his bringing up, so different from ours. The thing that
troubles me most is seeing him bounced up and down on pretence that
it is necessary to do so to cure an ailment which we call ricketts, which
attacks babies."

Letter from Donna Vittoria.

" Montecuccoli, Davia.
" Le petit prince, habillé comme en godenot (mannikin) mais beau,
gai, qu'on élève en dansant.[1]

" Mme. de Sévigné."

Judging by the Lady Sedley's selection of their prescriptions,
eminent physicians of her day do not seem to have been in any way
emancipated from the general credulity and superstition which prevailed
concerning old-time remedies. Prescriptions culled from non-medical
sources were no doubt quite as efficacious as those provided by the
faculty. And therefore we find receipts for stone by the Duke of
Monmouth and by Judge Ellis,[2] and by the Lady Mildmay for fistula.
His receipt for stone contained Venice turpentine distilled with various
herbs and spices in small ale. It was only to be made in the month of
June, and was to be taken " three days before the full, and three days
before the change of the Moone." The Duke of Monmouth relied on
ripe haws, fennel roots, distilled in white wine and taken with syrup
of elder.

The Lady Mildmay's cure for fistula was a herbal drink, but for
a speedy cure " you may tent the wound or sore, and lay thereon a
Colworth leafe."

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[1] " The English Court in Exile," by E. and M. S. Grew (Mills and Boon), pp. 92-3.

[2] Judge Ellis was raised to the Bench in 1673 and died " grandævus Senectute," aged 71,
in 1680. His shield of arms is to be seen in one of the windows in Gray's Inn Hall.

Lady Sedley's Snayle Water—good for obstructions of the liver and for consumption—was a distillation of snails and earth-worms, with many herbs and spices, added to strong ale.

Oyle of Swallows.—Every part of the swallow was considered good for some or other disease, and especially for dimness of sight and the falling sickness. The "oyle" itself was made by pounding in a mortar "ten or twelve young swallows ready to fly together with their gutts and feathers." They were then boiled with lavender, thyme and sage in fresh butter. The compound was strained through a linen cloth and used for sprains and weakness of the sinews.

One of the prescriptions for toothache, which is not however endorsed "Probatum est," is very puzzling : "Take a pint of white wine vinegar, take the quantity of 3 beere glasses of the finest Venice glass, putt all the Venice glass into the fire when you must burn it until such time as it is ready to dissolve to nothing. Then take it out of the fire and put it into the white wine vinegar, when if it be not burnt it will melt and dissolve to nothing. You must when you are troubled with the Toothache take some thereof warm in a dish, then take a mouthfull and keep it in your mouth as long as you can without swallowing, for to swallow much on't would be as bad as ye poison."

The loathsome remedies derived from human and other urine and excrement which are found in pharmacopœias of the day are only represented in two of Lady Sedley's prescriptions. One of these for "giddiness of the head" (Dr. Jacob's) contains peacock's dung, and the other, for black jaundice, is an infusion of sheep's ordure in Rhenish wine.

It must be remembered that nothing was considered so common or unclean that virtue could not be extracted from it in the shape of "spirit, salt and sulphur" by means of heat. Willis speaks of several cases in which fresh human urine was efficacious in gout and scurvy. The various preparations of urine owed such value as they possessed to the urea, carbonate of ammonia and other salts which they contained. Willis describes the infusion of horse dung as "a vulgar but no contemptible remedy in pleurisy and jaundice," aud says that the fæces of birds and animals owe their virtue to the volatile salts contained therein.

Cosmetics.—Interspersed with directions, "How to cook a calf's head, "how to make black puddings," and other culinary advice, are several recipes, such as "For a redd face"; to take away "red rubies that growe on the face by reason of the heate of the Liver"; to "make

haire growe," and to take it away ; to make the teeth white ; and
to remove " ffreckles " or " morphew," a term which also included
" ringworm." Oil of peach-kernels and gourd seed and plantin water
were chiefly used for the complexion. An ointment of bees roasted
on a shovel and boiled in salad oil was used to make hair grow.
Leeches baked to powder and mixed with brandy " cause hair to grow,
when the bald place is also anointed three times with the blood of a
mole."

Tetters, or canker, which includes herpes and any scaly eruption,
was treated by bathing with rock alum, honey, sage, rosemary, and
columbine in strong ale ; or by celandine, bay salt and lemon juice—
hardly a soothing application, one would think, in cases of herpes.
Celandine (chelidonium) still forms the basis of some patented corn
and wart cures.

" The Lady Sedley's Receipt Book " is of some historical interest,
for she was the wife of Sir Charles Sedley, wit, writer of plays and
sonnets and boon companion of Charles II. She was the daughter of
John Savage, Earl of Rivers, and married Sir Charles Sedley, February
23, 1657. Their only child and heiress was the notorious Catherine,
Mistress of James II, and created by him Countess of Dorchester. My
reason for believing that the Lady Sedley, to whom the Receipt Book
belonged, was the wife of Sir Charles, is that no other person entitled to
her description appears in " Guillim's Heraldry," published in 1679.

Those who are familiar with Samuel Pepys's Diary will remember
sundry references to Sedley's mad pranks and dissolute behaviour. In
1663, he, Lord Buckhurst, and Sir Thomas Ogle got drunk at the
" Cock " in Bow Street and caused a riot by their grossly indecent
conduct, for which Sedley was find £500. In 1668, he and Lord
Buckhurst again scandalized everybody by running " sans culottes "
about the Strand. On this occasion the King took their part, and
Pepys feared that the Lord Chief Justice Keeling would " lay the
constable by the heels " for daring to arrest these fine gentlemen.
Again in October, 1668, Pepys repeats the gossip that the King, Sedley,
and Buckhurst were all drunk together at Saxham. Pepys's allusions
to Sedley are, however, not always uncomplimentary. On two occasions
when he sat near him at the play, he found his audible comments on
the performance " mighty witty." The practical side of Sedley's
humour is shown in his treatment of Kynaston, the actor. Kynaston
fancied himself on his resemblance to the fashionable Sedley, and made
himself up to look still more like him. Whereupon Sedley hired a

" bravo " to thrash him and to pretend that he really mistook him for Sir Charles Sedley. According to his biographer,[1] " The King never would part with Sedley, so he never would part with the King," although " his estate was never the better for the court," and his " morals much the worse." Charles liked him because he never asked him for anything, whereas the other courtiers were always begging of him. " The King singled him out for the best genius of the age, and frequently told his familiars that Sedley's style either in writing or discourse would be the standard of the English language."

Sedley wrote a large number of poems and sonnets, and also three plays, besides collaborating in the composition of others. But his works hardly bear out Charles's estimate of them, though he is still remembered as the author of the charming lyric, " Phyllis is my only joy." His verses are neat and simple in diction, and not quite so coarse as those of Rochester, Buckingham, and even Cowley in some places. They are mostly, as Rochester described them, " mannerly obscene."[2] His plays, of which " Bellamira," or the " Mistress," has been accounted the best, are both tedious and licentious.

In 1680, Sedley met with an accident thus recorded in the Hatton correspondence (Camden Society, vol. i, p. 216) : January 15, $16\frac{79}{80}$: " Yesterday ye roof of ye Tenis Cote in ye Haymarket fell down. Sir Charles Sedley, being there, had his skull broke, and it is thought it will be mortall. Sir George Etheredge and several others were very dangerously hurt." Another account of the accident given in the Memoir (op. cit.) is that " It was at the acting of his play called 'Bellamira' that the roof of the playhouse fell down. But what was particular was that very few were hurt but himself." His " merry friend," Sir Fleetwood Shepherd, told him " There was so much fire in the play that it blew up the poet, house and all." Then, lest the poet should be unduly elated, he added : " No, the play was so heavy it broke down the house and buried the poet in his own rubbish."

It may have been partly on account of this accident or for domestic reasons hereafter mentioned that Sedley withdrew from London as

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[1] Cf. Works of the Hon. Sir Charles Sedley, with memoir of the author's life written by an eminent hand, 1776.

[2] " For songs and verses mannerly obscene,
 That can stir Nature up by springs unseen,
 And without forcing blushes, warm the Queen,
 Sedley has that prevailing gentle art
 That can with a resistless charm impart
 The loosest wishes to the chastest heart."   (Lord Rochester.)

much as possible after the death of Charles II, but he did not retire from political life. Several of his speeches in Parliament as member for New Romney are included in his printed works. A passage from the last of these, delivered in 1699 during a debate on a " Bill for disbanding the Army," will bear quotation. It ends : " If we are true to ourselves, 10,000 men are enough ; and if not, 100,000 men are too few." He died in 1701.

Catherine, daughter of Sir Charles and the Lady Sedley, was born in 1657. Evelyn described her as "none of the most virtuous but a witt." She was pale, and squinted, and was otherwise so plain that Charles II said that he supposed she was prescribed to his brother James by his confessor as a sort of penance. She professed herself unable to account for James's infatuation for her. " It cannot be my beauty," she said, " because everyone knows I have none, and it cannot be my wit, because he is too foolish to appreciate it." Howbeit, there can be no doubt that she exercised a singular fascination over James and others. She posed as a Protestant, and use was made of her liaison with James for political reasons. The climax was reached when she was created Baroness Darlington and Countess of Dorchester on January 19, 1686, with an allowance of £5,000 per annum. This was a deadly insult to the Catholics, and Queen Mary was so much incensed that she went on " hunger strike " for two days. James only succeeded in persuading her to take food by scourging himself in her presence. The Queen kept the scourge and afterwards bequeathed it to the Convent of Chaillot, but the Countess eventually got the money. James seems to have had a rather unpleasant time with his Queen and a roomful of her priests and confessors, and the result was that Catherine was ordered to withdraw from Whitehall and advised to pay a visit to Flanders. She objected to Flanders on the ground that " the number of convents there would render the air too oppressive," and she went to Ireland instead. But, not liking Dublin, she returned in August, 1686. James immediately fluttered back to her side, but the reunion did not last long. Her political importance was gone for the time and her pension remained unpaid. Her father, Sir Charles Sedley, does not seem to have been on good terms with his august son-in-law. He was instrumental in procuring the accession of William and Mary, and remarked afterwards that he and James were even, for, " if he has made my daughter a Countess, I have helped to make his daughter a Queen." In return for Sedley's good offices, the Countess received a grant of £1,500 a year from William and Mary in May, 1691, and in 1703 her original pension of

£5,000 a year was restored by a grant of the Irish Parliament. In this year she was conspicuous at the Coronation of George I as the wife of Sir David Colyear, afterwards Earl Colyear, whom she married in 1696. Ultimately, like Becky Sharp, she is said to have become pious. She died at Bath in 1717.

Of the Lady Sedley herself, we have little information beyond that which may be inferred from the " Receipt Book " which she compiled. There is a note, however, concerning her in Burnet's " History of my own Times " (vol. iii, Ed. Oxford, 1823, p. 114), which is of interest. Referring to her daughter—Lady Dorchester—one of the editors, " D.,[1]" writes: " The best excuse that could be made for her was that her mother, Lady Catherine Sedley, had been locked up in a mad-house many years before she died." But it is clear that she must have been in full possession of her senses in the year 1686, when her book was commenced. As we have seen, the year 1686 marked an important epoch in the lives of the Sedley family. It coincided with the retirement of Sedley from the court, and with the social ostracism of the Lady Dorchester. We may well imagine that poor Lady Sedley welcomed the return of her wayward husband and erring daughter to the family seat at Southfleet; surely her famous " cordialls " and " wound waters," her cures for ailments of the head, stomach, liver, and kidneys were designed to patch up the damaged constitution of the one; whilst her face washes, unguents, and cosmetics might serve to impart to the other, some of the loveliness which Nature had denied her. Moreover, in order to keep them with her, she must feed them well, and hence her excellent recipes for table delicacies. These reflections lead one to attach a faint tinge of romance to the faded pages of the Lady Sedley's Receipt Book.

OTHER RECEIPT BOOKS OF THE PERIOD.

There are probably many MS. Receipt Books like Lady Sedley's hidden and forgotten in the libraries of old country houses. Several manuscripts of the kind are to be seen in the MS. Department of the British Museum. The most important is " Mary Doggett: Her Book of Receipts, 1682 " (No. 27466, Sloane). A MS. note on the first page says: " This Mary was the wife of Doggett the Player who left a legacy of a yearly coat and badge to be rowed for." The competition for " Doggett's Coat and Badge " amongst Thames watermen still takes

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[1] " Earl of Dartmouth.

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place annually in August. Thomas Doggett's original announcement
of the ceremony, on August 1, 1716, was as follows: "This being the
day of his Majesty's happy accession to the throne, there will be given
by Mr. Doggett an orange livery with a badge representing Liberty, to
be rowed for by six watermen that are out of their time within the
year past." Mary Doggett's "Book of Receipts" is in large 4to, folios
307. It is beautifully written throughout, in handwriting much re-
sembling that of Lady Sedley's amanuensis at its best, and contains
an index of "Waters and Phisicall Receipts for the Stillatory." It
includes cookery and miscellaneous receipts such as "How to Souse
a Pigg"; "To wash Parti-coloured stockings"; "To make Perfumes
and Sweete Baggs"; "To Pickle Cowcumbers," and to "Collar Beef,"
besides many medical prescriptions from various sources; Dr. Lower's
"Bitter Infusion with Filings of Steele," and the method of making
"Puppy Water," a distillation of a young fat puppy and a pint of
"fasting spittle" in a quart of new butter-milk, 2 quarts of white
wine, lemons, egrimony and camphire.

The MS. next in importance (Sloane, 1367) is "My Lady Ranelagh's
Choice Receipts, as also some of Captain Wilks, who valued them above
gold." It is undated. It is a long narrow volume, like a modern
washing book, containing 83 folios and 292 recipes in small cramped
handwriting. It has an alphabetical list of herbs and their values, and
also an index of chemical and astronomical symbols, and a key to "our
own abbreviations." The prescriptions are culinary and medical and
are taken from medical and other authorities (including Lady Ranelagh's
sister, the Countess of Warwick, of whom more anon) and from printed
books and pharmacopœias of the period.

Sloane, 556, is "A booke of Medicens collected, being most of them
pv̄d medicens to healp. Written by Mr. Anthony Lewis, the 23rd day
of January 1696 out of a booke which was the La. Marquies Dorsetts."[1]
Recipes for cooking, farriery, and medicine are included in it.

Sloane, 28956, contains recipes for medicine and cookery, chiefly in
the writing of members of the "Ellis" family, possibly including Judge
Ellis, whose receipt for stone has been mentioned.

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[1] Anne, daughter of the Earl of Cumberland, married first, Richard, Earl of Dorset, and
secondly, Philip, Earl of Pembroke. A portrait painted of her during widowhood provides
her with two recipe books; and another, painted when she was aged 13, contains a large
assortment of learned books.

Seventeenth-century-printed Books of Culinary and Medical Recipes.

The first and most important of these is by Elizabeth Grey, Countess of Kent (1581-1651) and is entitled, " A choice Manual of rare and select Secrets in Physick and Chirurgerie, Collected and practised by the Countess of Kent (late dec'd)," 12mo. The second edition, which is the earliest in the British Museum, was edited by W. Jar and appeared in London in 1653. It went through nineteen editions and the Lady Kent's " Testacious powder," consisting of white amber, crab's eyes (i.e., concretions in the heads of crabs, not the eyes themselves) and " corall," hartshorn and pearl, was of such repute that it was included in Quincy's Dispensatory, 1739.

"The Ladies Dispensatory, containing the Nature, Virtues, and Qualities of all Herbs and Simples usefull in Physick, reduced into a Methodicall order, for their more ready use on any Sicknesse, or other accident of the Body, the like never published in English," is by Leonard Sowerby, and was printed in 1652. The author in his preface states that it is based on the works of Dioscorides, Gerard, Goræus, and Fuchsius. At the end there is an alphabetical " Table of the Virtues of the Simples " contained in this book. It is comprehensive, for it contains remedies suitable for treatment of the " bitings of Shrew mice," " The bitings of Crocodiles and Cockatrices," " The Venomes and poysons of Toads and Greene Froggs," and of many other noxious insects and reptiles. Some of the morbid conditions which are mentioned, and for which treatment is prescribed, may seem out of place in a " Ladies Dispensatorie," but the book was no doubt intended to meet domestic emergencies of the most intimate kind and character.

" The Ladies Cabinet, Enlarged and Opened, containing many rare Secrets and Rich Ornaments of severall Kindes and Different uses, Comprised under three general heads—viz., (1) Preserving, conserving, candying, &c. ; (2) Physick and Chirurgerie ; (3) Cookery and House-wifery ; whereunto added Sundry experiments and choice extractions of Water Oyles, &c. Collected and practised by The late Right Honourable and learned Chemist, the Lord Ruthven."

The second edition of this pretty little book, with additions and a particular table to each part, was published in London in 1655. I do not know when the first edition appeared, but it seems to have been used as a model for " the Queen's Closet Opened," the first edition of which, Dr. A. W. Oxford informs me, was not published till 1657. The tenth edition of the latter work, published in 1696 with a preface by " W. M.,"

is entitled " The Queen's Closet Opened, being incomparable Secrets in Physick, Chyrurgery, preserving and candying, &c., which were presented to the Queen by the most experienced Persons of the times, many whereof were had in Esteem when she pleased to descend to private Recreations." The Queen was of course Henrietta Maria. It is a neat 12mo volume divided into three parts : (1) " The Pearl of Practice " ; (2) " The Queen's Delight " ; (3) " The Compleat Cook." A table of authorities gives the names of Edward VI, Queen Elizabeth, Charles I, Queen Mary, Lady Elizabeth, daughter to Charles I. Edward VI and Queen Elizabeth supply recipes for perfumes, Charles I and his Queen one for the plague, which the Lord Mayor had from the Queen. " There is no medicine more excellent than this when the sore doth appear, than to take a cock chick and pull it, and let the Rump be bare, and hold the Rump of the said chick to the sore, and it will gape and labour for life, and in the end die ; then take another and a third, and so long as any one do die ; for when the poyson is quite drawn out the chick will live, the sore presently will assuage, and the party recover. Mr. Winlour proved this upon one of his own children ; the thirteenth chick dyed ; the fourteenth lived, and the party cured." The physicians whose names are attached to prescriptions are twenty-five in number, amongst whom are Dr. Mayhern (Sir Theodore Mayerne), Dr. King, Dr. Bates and Dr. Stephens, several surgeons and an oculist " Master Stepkins." (Red rose water with " Lapis Tutiæ," obtained from the fumes of melting brass which adhere to the sides of the furnace.)[1] W. Laud, Archbishop of Canterbury, contributes Dr. Stephen's water and the Bishop of Worcester an " admirable curing Powder " of crab's claws, musk, civet, ambergreese, adder skin and hartshorn. The nobility are represented by Viscount St. Albans (" the ale of health and strength "), Lord Spencer (cherry water) and Lord Sheffield (" for the cough of the lungs ") and by the Countesses of Arundel, Worcester, Oxford, Kent, Rutland ; Ladies Mounteagle, Abergany, Nevil, Spotswood, Denny, Gifford, Hobby, Leonard, Smith, Goring, Mildmay, Bray, Dacres, Thornburgh, Mallet, and others. Sir Kenelm Digby's " Aqua Mirabilis " occurs, and also a cordial water of Sir Walter Raleigh's—a gallon of strawberries infused in a pint of aqua vitæ. Amongst the commoners the name of Master Lucatello is given. The balsam of Lucatellus is contained in Lady Sedley's book, and also in Quincy's dispensatorie. It was an internal

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[1] In the " Southsea Castle " MS. of Recipes in the Royal College of Physicians' Library (1663-1671) " *Tutia* " " for the sight " is said to have been advised to the Emperor of Constantinople in the year 1438, " at ye Synod of Ferrara, and with good success."

" Vulnerary " and cough cure made from olive oil, wax and Venice turpentine with red Saunders in canary wine. The law is represented by Mr. Justice Hutton, who, like his learned brother Judge Ellis, contributes a receipt for the stone.

It is evident, therefore, that in compiling her own " Receipt Book " the Lady Sedley was but following the example of many other ladies of position in her day. Evelyn says of the women of his youth that " their recreations were in the distillatorie, the knowledge of plants and their virtues for the comfort of their poor neighbours and the use of their family." [1] Both in the sixteenth and seventeenth centuries, part of the education of women included acquaintance with the preparation and medicinal use of herbs and simples. But the well-meant efforts of noble ladies to use their knowledge of therapeutics on behalf of their poor neighbours was not altogether approved by the faculty. Dr. Walter Harris writes in 1689 of " country people who, lying at a considerable distance from physicians, are supported by my Lady's Cordials out of Charity, which her Ladyship exhibits promiscuously in every disease with very great applause; for be the event what it will, the Cordial, to be sure, must never be blamed." [2] Sydenham also complained that " Nowadays every house has its old woman, or practitioner, in an art that she has never learnt, to the killing of mankind." And to judge from biographies and memoirs of certain great ladies of the seventeenth century, the complaints of Harris and Sydenham may not have been altogether groundless.

We find many notable examples of such noble women in " Home Life of English Ladies in the 17th Century," by the author of " Magdalen Stafford " (published 1861).

Most conspicuous amongst these was *Anne Countess of Arundel* (1595—1630), who turned her house into a kind of hospital, supplying " medicines, salves, plasters, and other remedies to all kind of people who either wanting will or means to go to Doctors and Chyrurgeons came to her for the curing of their wounds and distempers. And her charity herein was so famous that not only neighbours but several out of other shires, 20, 40 more miles distant, did resort unto her to

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[1] Mrs. John Evelyn was herself a notable housewife, from whom Evelyn probably obtained the recipes he appended to his " Acetaria." Her mother was Lady Brown, wife of Sir Richard Brown, our Ambassador at Paris. Lady Brown's house is described as " an Asylum for her exiled Countrymen and an hospital for the sick and needy " (" Home Life of English Ladies in the Seventeenth Century," p. 42).

[2] Walter Harris, " De Morbis Acutis Infantum," Martyn's translation, 1742, p. 61.

that end, and scarce a day passed on which many did not come, some-
times more than 3 score in a day." As she usually gave "Almes in
Money," besides advice and medicine, one is not surprised to hear that
"some, now and then, would feign infirmities." She ordered divers kinds
of drugs to be bought every year to make her salves and medicines . . .
and would even be present at the making of them. . . . "Three
score dozen of Sheepskins were spent some years merely in making the
plasters she gave, and about 1 cwt. of one only matter, whereof some of
'em were made for aches and other accidents. Some she would take
into her house for more than a quarter of a year, and others whom she
could not cure of their distempers . . . she provided that they might
be received into London Hospitals and cured. Others again I have known
who, being dismissed from the Hospitals as incurable, she out of com-
passion has taken again into her own house and in the end has cured
them, God especially assisting."—"The Life of Anne, Countess of
Arundel," by H. G. F. Howard (Duke of Norfolk), published in 1857,
p. 213.

Lady Anne was the daughter of Lord Dacres; she married Philip,
Earl of Surrey and Arundel. She was educated by her maternal grand-
mother, Lady Mounteagle, who also "did excel in the curing of diseases,
wounds, and the like." Lady Mounteagle married secondly the Duke
of Norfolk, who was beheaded in 1572. Prescriptions by Lady Dacres,
Lady Mounteagle, and by the Countess of Arundel and her husband are
contained in the "Queen's Closet Opened."

Lady Warwick (1625—1678) (née Mary Boyle, daughter of the Earl
of Cork) married Robert Rich, afterwards Earl of Warwick. Burnet
speaks of her as "a worthy sister of Robert Boyle and distributor of the
fruits of his study of chemistry." Dr. Walker, for many years chaplain
to her family, says in his funeral sermon over her: "If any were sick or
tempted, or in any distress of body or mind, whither should they go but
to the good Countess, whose closet or still house was their shop for
Chirurgery and Physick?" She and her elder sister, Lady Ranelagh,
probably collaborated in producing the "choice receipts" contained in
her MS. already described. Moreover, the sisters had the advantage of
co-operation with Mrs. Elizabeth Walker, wife of Dr. Walker, chaplain to
the Warwicks, and afterwards Rector of Fyfield. Elizabeth Walker (née
Sadler) left an autobiography, and her husband wrote a memoir from
which we learn ("Holy Life of Mrs. E. Walker," by Anthony Walker,
1690) that she imparted to her daughters "whatever requires more art
or curiosity for the Closet or the parlour, as preserving, drawing spirits

in an Alembic, or cold Still, pastry, &c. . . . She caused her daughters to transcribe her best recipes for things which were curious, but especially for Medicines, with directions how to use them. For she was skilled both as a physician and surgeon, and one of her sisters being married to a very able doctor of the London College, she obtained from him 'many receipts' . . . and she was very inquisitive of other doctors, and had many English books, Riverius, Culpepper, Bonettus, &c., which she read, not to say studied. And good stores of vomits, purges, sudorifics, cordials, pectorals, almost all kinds of syrups, strong waters, several quarts of which she left (yea, gallons of them she used most)." These three ladies must have left very little for the local practitioners to do, considering that the apothecaries of the time were paid for medicines and appliances, but not for their advice. Amongst other ladies of similar tastes and pursuits may be mentioned Lady Maynard, who died in 1684. "She was a common patroness to the poor, and a common physician to her sick neighbours. Often she would with her own hands dress their most loathsome sores, and sometimes keep them in her home till cured" (funeral sermon by Bishop Ken).

Of *Lady Alice Lucy* we are told that "at all times when any wanted health . . . she cheerfully communicated whatsoever she conceived conducible to their recovery, having not only great store of cordials and restoratives always by her, but great skill and judgment in the application of them." (Extract from Memoir, "English Ladies of the Seventeenth Century," pp. 174-5).

Lady Anne Halkett (1622-1699), as we learn from her autobiography (Camden Society, 1875), also tended wounded soldiers, and distinguished persons came to her at Fyvie.

Lady Brilliana Harley's delightful letters to her "Sonn Edward," when an Oxford undergraduate in 1639, are full of affectionate advice as to the care of his health. She sends him a "Bessor stone" to keep in his pocket, 2 gr. of "orampotabily" (aurum potabile) with instructions for use, besides "eye watter" and other remedies. (Camden Society, 1853.)

The names of many more might be added to the list, and if, like Sydenham and Harris, we are inclined to cavil at these ladies' claims to practise an art which they had never learnt, to the "killing of mankind," we must, nevertheless, remember the woeful plight of therapeutics at the time. The simple herbal recipes of Lady Sedley and her like were harmless in themselves, and not a whit less based on ignorance and gross superstition than many which they prized as bearing the stamp of

highest medical authority.   But a new era in medicine was dawning
at the time Lady Sedley compiled her book, though as yet it remained
unrecognized.

One has only to look at the pharmacopœias of the period to see
that the science of therapeutics was in a state of hopeless confusion
owing to the multiplicity of remedies and to the extraordinary virtues
with which each and all were credited.   Hence it was that no pre-
scription was considered complete unless it included nearly every drug
which at one time or another had been reckoned good for the com-
plaint which required treatment.   Hosts of inert substances and incom-
patibles of every sort and kind were heaped together in reckless liberality.
It can only be said in excuse of blind and irrational prescriptions that
the quantity of any active drug which they contained was too small to do
much harm.[1]   But a revolt was taking place against methods of treat-
ment which could be as well carried out by Lady Sedley, with the aid of
a collection of formulas, as by the most skilful of physicians.   One of
the pioneers in this direction was Gideon Harvey (b. 1630-40), a kind
of Paracelsus or " free lance " against the therapeutics of his day.   With
caustic wit he relentlessly exposed the fallacies and absurdities of the
general methods of treatment in vogue.   He was, no doubt, a scurrilous
and unscrupulous person, yet, to his credit, he pleaded for simplicity in
prescribing, and insisted, in contradiction to Sydenham, that the " fewer
the ingredients the better is the medicine."   His motive in inveighing
against accepted modes of treatment was to convey the impression that
he alone was the possessor of secret cures, but he succeeded in awakening
criticism of the curious jumble of ill-assorted and mostly inert remedies
which disfigured the London Pharmacopœia.   Indirectly he was respon-
sible for the reduction in number of preparations from 1,646 (Salmon's
Dispensatorie, anno 1696) to 643 in Quincy's English Dispensatory,
1739.

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[1] *Venice treacle* contained about 1 gr. opium in 4 scruples ; dose, 1 scruple to 2 **dr.**
Mithridate, 1 gr. opium in 4 dr. 2 scruples ; dose, the same as of Venice treacle (Quincy.).

BIBLIOGRAPHY.

MANUSCRIPTS.

" The Lady Sedley : her Receipt Book," 1686. (In writer's possession.)

" Mary Doggett : her Book of Receipts," 1682. (Sloane MS., No. 27,466, British Museum.)

" My Lady Ranelagh's choice Receipts, etc." (Sloane, 1367, British Museum.)

" A booke of Medicens collected, being mostly pv̄d Medicens to healp," by Anthony Lewis, 1696. (Sloane 556, British Museum.)

" Southsea Castle MS." (Royal College of Physicians Library, 1663-1671.)

" Mompesson MS." 1730, Medical Society of London. (Probably compiled by descendant of Mompesson, Rector of Eyam, whose services to his parishioners at the time of the Great Plague will be remembered.)

PRINTED BOOKS.

" A Discourse of the cure of Wounds by Sympathy," by Anthony Highmore, London, 1651.

Dispensatories (Salmon's, 1696, and Quincy's, 1739).

Crawfurd, Raymond, " Last Days of Charles II."

" English Court in Exile," by E. and M. S. Grew (Mills and Boon), pp. 92-3.

Burnet, " History of my own Times," Oxf. ed., 1823, note, vol. iii, p. 114.

" Dictionary of National Biography," Art., Sedley, Sir C. ; Sedley, Catherine ; Grey, Elizabeth, Countess of Kent.

Pepys, Samuel, " Diary," 1663-8.

Evelyn, John, " Diary," June 13, 1673 ; January 19, 1686.

" Works of the Hon. Sir Charles Sedley, with Memoir written by an Eminent Hand," 1776.

Camden Society, " Hatton Correspondence," i, p. 216.

Camden Society, 1875, " Lady Anne Halkett's Autobiography."

Camden Society, 1853, " Lady Brilliana Harley's Letters," 1639.

" Holy Life of Mrs. E. Walker," by Anthony Walker, 1690.

" Home Life of English Ladies in the Seventeenth Century," by the author of " Magdalen Stafford," 1861.

" Life of the Hon. Lady Anne, Countess of Arundel," p. 213.

PRINTED RECEIPT BOOKS.

" A Choice Manual of rare and select Secrets in Physick and Chirurgerie, collected and practised by Elizabeth Grey, Countess of Kent," (?) 1651-2.

" The Ladies Dispensatory," by Leonard Sowerby, 1652.

" The Ladies Cabinet Enlarged and Opened," 2nd ed., 1655.

" The Queen's Closet Opened," 1657.

PORTRAITS.

Godfrey Kneller's portraits of Catherine Sedley, Countess of Dorchester, and of Sir Charles Sedley, were sold at Christie's for £1,000 and 360 guineas respectively on February 28, 1913. These portraits were formerly in possession of the Rev. E. H. Dawkins, of Morhanger House Bedfordshire, and were purchased by Messrs. Agnew.

DISCUSSION.

Dr. DENNIS VINRACE said he felt that the Section was much indebted to Dr. Guthrie for his scholarly and historical paper. There was one point about which he felt some doubt—namely, as to whether the books such as had been described, dealing with botany and herbal remedies, were the foundations of the Pharmacopœia. Neither in Dr. Guthrie's paper nor in Mr. Barlow's on a cognate subject, was any mention made of the British Pharmacopœia. There was such a work in existence now, though he did not think anyone was guided by it or took much notice of it. He wondered whether in those early days the profession had to rely on the excellent works which had been quoted, or was there an authorized Pharmacopœia? He possessed a copy of the British Pharmacopœia dated 1627, in excellent condition, and it was interesting to see that it contained a number of remedies which still held their own. Another interesting reflection was as to plagiarism. According to Mr. Barlow's excellent paper, that was no new sin. He feared it still obtained, for perusals of the journals would show that every now and then a drug was re-discovered, with a claim to priority. It was highly important for medical men to study what had been done in the past, and he thought this Section must have a great influence in this direction.

Dr. GUTHRIE replied that he mentioned in his paper two of the Pharmacopœias which were practically based on the London Pharmacopœia. One was Salmon's in 1696. The second was Quincy's, which came out in 1739. They were the embodiment of the Pharmacopœias of the day, but with emendations by both Salmon and Quincy.

Examples of Old Drug-pots.

By J. D. Marshall.

In "Prehistoric Times" Lord Avebury says no fragment of pottery connected with pharmacy has yet been found, nor is there any evidence of palæolithic pottery. In Egyptian tombs small pots or jars are found made of terra-cotta unglazed. In addition to instruments, &c., pharmacy pots were often found during the excavation of Pompeii and Herculaneum, and are still shown in the museums of Naples and Florence. The pharmacy jars that are to us most interesting were those made in England from early Tudor times to late in the eighteenth century, and in Italy, Spain, France and Holland; we must exclude Chinese and Japanese entirely. These we call mediæval pottery and divide into Majolica and Faience, the former being the production of Spain and Italy, the latter being principally Dutch and English, and also being generally of a later date than Majolica. The material of which these interesting containers were made consisted of baked clay, surmounted by enamel or glaze.

The earliest examples of Majolica were Hispano Moresque lustre ware, made by the Moors during the period they occupied Spain, and by them undoubtedly copied from the Orient; they are decorated with Moorish designs and painted with metallic colours. They were principally made at Malaga, Toledo, Valencia and Barcelona. Good specimens of this ware are found in the British Museum and were made in the fourteenth and fifteenth centuries. Of far superior artistic design and finish are the familiar Italian Albarelli, the shape being an elaboration of a joint of bamboo in which drugs were packed and imported from the East in olden days; this shape was one easy to handle and so most appropriate for the purpose of storing drugs and galenicals. The most usual decoration was of one colour, being a combination of the horizontal bands and disks, with frequently some small ornament such as a trefoil or a little wavy line, very rarely the bands and disks alone. On some specimens, figures and faces are also painted and coats of arms or other insignia which are most rare; when the decorations are tints of one colour only they are called in "camaieu." As the art of the potter advanced the decorations became more beautiful and were executed in several colours, such as rich red, blue and green, the designs frequently being very ornate and beautifully executed, termed polychrome.

The earlier forms of Majolica were covered with a glaze containing lead, but the latter and more beautiful were glazed with a tin preparation. In the Musée de Cluny there are two vases dated 1500 with the word Faenza, which is considered the oldest factory of Majolica in Italy; the British Museum also contains several very beautiful examples of this date, specimens which I wish it were possible to show this audience, but which will well repay a visit to observe; the South Kensington Museum has another from Faenza inscribed Dia Chassia which has represented on it a man powdering drugs in a mortar—the man is sitting on the floor with the mortar between his legs.

In the latter part of the fifteenth century the Duke Guid Urbaldo II had a set of pharmacy jars made at Urbino for his domestic pharmacy, probably the most costly in the world. At his death his successor presented them to our Lady at Loreto, where they are still preserved. The Duchy of Urbino had several potteries which manufactured very beautiful pharmacy vases, one at Castel Durante being established as early as 1361, of which many specimens are still preserved.

France contributed considerably to the manufacture of faience, the rarest examples being made at Sainte Pochairé. The Museum of Rouen contains many specimens of rare beauty, and this manufacture is considered the most artistic in France. They were made in blue camaieu and polychrome, the shapes being exceedingly fine. Strasbourg faience is well known, there being a very considerable number of plates and dishes of the peculiar red rose colour with green flowers and birds as decorations, the same treatment of colour being used for pharmacy vases; they are of later date, 1700-1800. Belgium, Germany, and Sweden also had potteries which produced pharmacy jars and ewers, but they are of less interest and poor quality as a rule.

By the term Majolica we understand a pottery formed of calcareous clay, gently fired, and then covered with an opaque enamel composed of lead, tin and sand; the biscuit has generally a light yellow tint or colour, disappearing under the opacity of the enamel, and also it effervesces when treated with an acid.

According to Piccolpasso, a potter of Castel Durante, who wrote a book about 1548 describing and illustrating the various wares and patterns, and who says that Guido of Savonia, who learned the potter's art at Castel Durante, transferred his factory and assistants to Antwerp, which brings us to the very interesting and clever Dutch delft. This kind of pottery with reference to pharmacy jars is perhaps of primary importance; the beautiful colouring and surface of the tin enamel which

formed such a good ground for painted decoration and at the same time concealed the rough earthen body of the ware was first made about 1600, and there is no doubt was the result of the very large trading interests that Holland had with China and Japan, from whence a large number of beautiful porcelain vases, &c., dating from the Ming dynasty, 1368 to 1644, were obtained, and even in those days were very valuable. Dutch and Italian potters strove to imitate as closely as possible to produce at home a ware that could compete in beauty and finish, as well as cost, with the blue and white Chinese porcelain that was imported, and this with a very considerable measure of success.

The method of manufacturing Dutch delft was as follows: The ware after being formed of carefully levigated clay, was baked into a biscuit state; it was then dipped into a tub of finely ground tin enamel held in suspension in water; when left to dry the moisture evaporated or was absorbed by the porous biscuit and a coating of white powder left on the surface. The piece was then painted and finally coated with a thin covering of transparent glaze of lead oxide; it was then fired for the second and last time. This system of decoration was applied to the "grand feu" in which only those colours were used that would stand the full heat of the furnace.

In the early part of the eighteenth century the practice of painting the finished ware with enamel colour which was afterwards subjected to the lower heat of the muffle kiln (au petit feu) became general, and this method is carried on very successfully at the Faience works of Boulogne-sur-Mer, where reproductions and original designs of many shapes and colourings are made in great quantities at the present time, and where I lately had the pleasure of seeing the modus operandi from the clay as brought from the pits through the various stages of puddling, enamelling, painting, firing, &c., &c., under the courteous and instructive ciceronage of the proprietor, who would I am sure be pleased to give welcome to any medical man who showed an interest in the work.

Some thirty years later than the date of the Dutch delft faience being started, the manufacture of delft was commenced in England by Dutch potters. As far as can be learned, Lambeth was the first of these potteries, where in 1671 John Ariens van Hamme took out a patent for making delft tiles after the way practised in Holland. Ultimately some twenty factories were at work in Lambeth, where pottery is still carried on as we all know by Doulton, Stiff and others, the clay being brought from various centres, much of it by water. Other towns, such as Bristol and Liverpool, became great centres where

pharmacy jars were made ; in Bristol Richard Frank and Thomas Flower were well-known makers in 1697.   Liverpool became noted for its pharmacy jars, which were made by Zachariah Barnes, who made these jars a speciality.   Early in the eighteenth century this pottery was the principal trade of the town and every merchant of note was concerned in its production.   Seth Pennington, 1760, made fine punch-bowls and for a long time possessed the secret of a rich and choice blue.   In the British Museum there is a beautiful drug-pot probably made by Pennington ; the colour equals anything I have had the fortune to see.

The delft of Dutch origin and that made in Lambeth, Bristol and Liverpool is of similar shape and generally alike, but after a little experience of handling the ware of both countries less difficulty should be experienced in discriminating the origin of the specimens. If one compares the specimens in the British and South Kensington Museums, and even some of those I have the pleasure of showing this evening, it will be seen that although the English ware was made by a similar process, and generally followed the Dutch style, there is a marked difference ; the Dutch delft has a body of finer and more care-fully prepared clay, the biscuit is softer, thinner and more resonant, the glaze is thicker, and owing to the body being softer it was capable of absorbing more of the fluid enamel, and so is whiter and more lustrous. The English body is harder and coarser and less resonant, the glaze is thinner and has often a rosy tint due to the paste showing through, and it has less adhesion affinity to the biscuit, consequently being fre-quently crackled or crazed.   The decorations of Dutch delft are perhaps the best guide, they being so far superior in skill of drawing and painting, often indeed highly artistic ; the English decoration, on the other hand, is usually very crude or a poor imitation of the Dutch ; the formation of the pieces is far neater and carefully worked in the Dutch, which is another guide.   The colours used for faience were blue, manganese purple, and yellow, occasionally black, green and puce, with sometimes a poor red which turned brownish in firing.

In England dispensing pots were made from a very early date ; although this statement has caused a strong controversy.   Mr. Henry Wallis in his book, " The Albarello," claims that these small pots are undoubtedly of Italian origin, and questions whether they were imported as pottery filled with cosmetics or drugs.   He further goes on to say : " The Italian writers on majolica will smile when they hear these particular albarelli were labelled in English museums and collections

English delft." The discussion arose principally on the specimens in the Guildhall Museum and the collection of Mr. Hilton Price lent to the Victoria and Albert Museum, all of which were excavated in London. An article in the *Burlington Magazine*, April, 1905, very ably differentiates and, I think, proves conclusively that most of these small pots were undoubtedly of English make. The writer showed that although the shape was a diminutive albarello, very rarely exceeding 3¼ in. in height, this was very much less than the ordinary albarello, which averages at least 7 to 8 in.

The form and decoration, having been learnt from foreign handicraftmen, were naturally strong in resemblance to the models from which the potters learnt their ideas, and also the fact that the native potters were keenly competing against imported pottery would be another cause for similar shape and decoration. Another peculiarity of the small London jars is the bevelled edge of the rim, which in Italian examples is almost invariably flat. They were probably made with the bevelled edge to hold in place the parchment tied over the mouth to preserve the contents.

An interesting proof of the albarello form being known as copied in this country during the Tudor period long before the introduction of enamelled wares are the two green glazed albarello shaped vases in the British Museum admitted to be of English origin. The general outline of form, as with the pharmacy jars, is also clumsy and thicker in the walls as compared with the Italian. The base also is a feature, being much more hollowed out in the London pots than in the Italian, which have an almost flat bottom. The motifs of the decoration have a strong Italian character, and were in many cases probably copied from a " pucca " albarello.

The evidence generally goes to show that every justification is given for collectors to label these pots English delft, although not necessarily Lambeth ; the shape and motifs having been shown to be familiar to English potters and commonly used by them quite a hundred years after the date assigned by Mr. Wallis, and they were probably made near where they are most usually found—namely, in London—and not where no traces of them ever occur—that is to say, in Italy.

One of the greatest enjoyments to a collector of pharmacy jars is the hunting for them. I never go for a walk without haunting some back street or lane either in London or country towns, and several of my most treasured pieces have been picked up for the proverbial old song. Unfortunately, the price of specimens is constantly growing higher; so many people now appreciate these old pots, some no doubt for the quaint

decorations, others for the shape; again, others for the inscriptions, to them most mystifying.   A factor is no doubt the large collections owned by such men as my friend, Mr. Deutertre, who has over 360 most beautiful specimens; who has also given me most valuable help in preparing this paper, and we all regret he is not here to give us his personal reminiscences of the joys and disappointments of a collector. M. Comien, of Antwerp, has also a superb collection amounting to over 320 pieces.

The collection of Mr. Hodgkin, which was disposed of in 1903, contained many valuable and rare examples, of which I have two or three specimens, and I want gratefully to express my thanks to Mr. Woolley for arranging the slides and also permitting me to use his knowledge; also to Mr. Masker, who has so kindly lent me a selection of valuable specimens from his collection.

The authorities of the British and Guildhall Museums have been most courteous in granting facilities for photographing specimens. I only wish we had been allowed to handle them here.

In conclusion, I trust the audience will forgive my temerity in attempting a paper on such a subject as this.   I am only a humble though enthusiastic collector, and I shall feel well repaid if others take an interest in the old utensils used by our predecessors in pharmacy.

Section of the History of Medicine.

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Sir Wm. Osler, Bt., F.R.S., President of the Section, in the Chair.

A Short Review of the History of Ancient Hindu Medicine.

By C. Muthu, M.D.

(I)

Ancient Civilization.

> " Thou art the Garden of the world, the home
> Of all Art yields, and Nature can decree ;
> Even in thy desert, what is like to thee ?
> Thy very weeds are beautiful, thy waste
> More rich than other clime's fertility."

The history of Hindu medicine takes us back to times of remote antiquity. From the earliest time India captured the imagination of the world. A glory of romance and a veil of splendour cast a mystic spell upon all her achievements. Whether it be in the domain of art or science, in poetry or philosophy, in religion or mythology, in commerce or manufacture, Ancient India excelled in almost every department of human activity or enterprise for many many centuries. The Western Nations, from Dr. Johnson downwards, have been content to trace the beginning of their civilization to Ancient Greece and Rome, which they have regarded as the key to all their knowledge and foundation of all their science. But if an impartial student of comparative history were to trace the stream which brought nurture to the thoughts of Greece and Rome to its source, he would no doubt be surprised to find India at the very fountain head irrigating and fertilizing the rest of the countries of the world with its culture, commerce and civilization.

To know something about the history of medicine of the Ancient

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Hindus it would be necessary to make a rapid survey of their civilization, their achievements in various fields of knowledge, and the part they played in the progress of the world.

The Antiquity of the Hindus.—The Hindus possess the oldest literature in the world in the hymns of the Rig Veda, which contain a history of the Aryas and of the ancient world from prehistoric times. Mr. G. Tilak, an oriental scholar, after careful and patient research into the astronomical allusions and references recorded in the old literature, has come to the conclusion that the oldest period in the Aryan civilization dates back from 6000 to 4000 B.C., which he calls the Pre-Orion period, when the Indians, the Parsees and the Greeks lived together in the common home. Professor Heeren calculates that the space of 6,042 years has elapsed from Dionysius (an Indian King) to Chandragupta. Megasthenes, the envoy of Alexander, discovered chronological tables at Polybhotra, the residence of this king, which contain a series of no fewer than 153 kings with all their names, from Dionysius to Chandragupta, and the duration of every one of their reigns, together amounting to 6,451 years, which would place the reign of Dionysius nearly 7,000 years B.C., and consequently 1,000 years before the oldest king found on the Egyptian tables of Manetho, who reigned 5,867 years B.C., and 2,000 years before Soufi, the founder of the Gizeh Pyramid.

Their Civilization and Emigration.—Opinion may be divided as to the site of the original home of the Aryas. But careful research into the Vedic literature shows that to the North-western Provinces of India to the countries bordering on the mouth of the Indus should be located the cradle of the Hindu civilization. It is there, between the rich land watered by the Five Rivers on the west and the Ganges on the east, that the Hindus made their earliest home, and shut in by the gigantic mountain barriers of the north, and endowed by Nature with a fertile soil, a keen intellect, a sublime mind, and rich with spiritual gifts, they had peace for centuries to develop a unique civilization, a mighty empire, and to found great states and powerful monarchies and kingdoms. For instance, the kingdom of Ayodhya (1500 to 2000 B.C.) prospered for 1,500 years. Kings of Magadha were Lords Paramount and Emperors of India for about 2,000 years, and their country the seat of learning, civilization, and trade. Ever since the Vedic period emigrations from Ancient India, both on a large and small scale, had been constantly going on from political, religious, commercial, and economic reasons, more perhaps after times of war than in seasons of peace

Egypt was one of the oldest colonies of Ancient India. The Hindu colonization of Persia seems to have taken place before the great war of Mahabharata. "Not only the language of Greece, but her philosophy, her religion, her subtle turn of intellect, her rivers and mountains, and above all the mysteries of that noble land, irresistibly prove her colonization from India." Thus, as Count Bjornstjerna says, "the civilization of the Hindus gradually extended itself in the west to Ethiopia, to Egypt, and to Phœnicia; in the east to Siam, to China, and to Japan; in the south to Ceylon, to Java, and to Sumatra; in the north, to Persia, to Caldaea, and to Colchis, whence it came to Greece and to Rome, and at length to the remote abode of the Hyperboreans."

Their Commerce and Science.—Their commerce was as extensive as their emigration. From ancient times commercial relations existed between North-west India, Malabar and Ceylon, and Egypt, Arabia, Persia, Babylonia, Assyria, Palestine, and Greece. The Hindus built ships, navigated the sea, undertook long sea voyages to dispose of their merchandise. From times of great antiquity India exported spices and aromatics, perfumes and precious stones. Her gold and silver brocades, her shawls and muslins, her cotton and silk, her purple and embroidered work, her pearls and rubies, her diamonds and gold, were some of the rich merchandise she exported viâ Alexandria, the great emporium of the East, to Egypt, Persia, Greece, Rome, and other parts of the world. As religion profoundly influenced the daily life and thought of the Hindus, they cultivated those sciences earliest that most helped them in their worship. Hence their sciences of astronomy, geometry, and practical anatomy, are very old. Even European scholars like Cassini, Bailly, Gentil, and Playfair maintain that there are Hindu observations extant which must have been more than 3,000 years B.C., and which evinced even then a very high degree of astronomical science. Of all the ancient nations, the Hindus alone had well-nigh accurately determined the rate of motion of the precession of the Equinoxes. The great antiquity of astronomy is the best proof of its originality. In the twelfth century A.D., Bhaskara expounded the law of gravity and the principle of Differential Calculus, thus anticipating Newton by many centuries. The geometrical theorem of the forty-seventh proposition, Book I, which tradition ascribes to Pythagoras, was solved by the Hindus at least two centuries earlier. Besides geometry, the Hindus invented trigonometry, algebra, the numerical figures (1 to 9) of arithmetic, the decimal system, and the game of chess, now used all over the world. The fables of animals from the time of Æsop

downwards had their original home in India.   The book of Sindebad is of Indian origin.   "The Thousand and One Nights" is a Hindu original translated into Persian and thence into other languages.   The tales of Panchatantra (five stories) were taken from the fables of Bidpai, the Indian sage, and translated from Sanskrit into Persian, Arabic, Greek, Hebrew, and other European languages, and have become the nursery stories for the amusement and instruction of the children of the whole world.

Alphabetical writing was known to India from the earliest times. Bjornstjerna says that the Hindu possessed written books of religion before 2800 B.C., or 800 years before Abraham.   Cotton paper was used in India before the Christian era.   They invented a language of unrivalled richness, harmony, and inflection—Sanskrit—which is the mother of all European languages.   The Hindus were a nation of philosophers.   The evolution theory of Kapilla, the atomic theory or Kanada, their theory of propagation of sound, of ether in space, their knowledge that light and heat are only different forms of the same essential substance, had been thought out centuries before the Christian Era.   Brahmin philosophers, in their sublime faith in the unity of God, in the creation of the world, in the immortality of the soul, in the goodness of God, in the responsibility of man, rose far above the ancient Greek, Roman, and Jewish teachers and philosophers.

(II)

Hindu Medicine.

The medical system of the Hindus is as old as their civilization, and has lent materials for laying the foundation in other countries.   No ancient nation can trace its healing art from prehistoric times, or present such a continuous though not a complete record of development for so many centuries.   From the Vedic period, which we can safely put down as 4000 to 2500 B.C., we can trace the rudiments of medicine rising in two or three tiny streams from the slopes of the Himalayas. (a) The early hymns of the Rig Veda make mention of medicinal plants and herbs, and the hygienic properties of water, air and vegetables. (b) The juice of the Soma plant is praised as the amrita (ambrosia), and medicine for a sick man, and gold and lead are spoken of as the elixir of life.   (c) Brahma, the chief of the godhead, seeing the suffering of mankind, hands down the Ayur Veda (the science of life) to Surya the sun god, who, like Phœbus, or Apollo of the Greeks, was regarded as

the fountain of medical knowledge. The twin sons of Surya (the Ashwins) become the medical attendants of the gods, and attend as surgeons in the wars between the gods and the demons, cure wounds and surgical accidents, and teach Indra (the rain god) the Ayur Veda. These tiny streams were the beginnings of materia medica, chemistry and surgery, and uniting went to form the nucleus of Hindu medicine in course of time. In the next stage of the Vedic period we descend from the cloudland of mythology to the early dawn of Hindu medicine, and find two distinguished pupils of Indra, Dhanvantari and Atreya. Dhanvantari, the divine physician, was the father of Hindu medicine as Æsculapius was among the Greeks, and is said to have brought the cup of amrita, the drink of immortality, and taught Susruta the science of surgery. Atreya taught his pupils on the slopes of the Himalayas, and wrote several works, of which Atreya Samhita stands foremost. All his pupils became famous, and each distinguished himself by writing a medical treatise, of whom may be mentioned Agnivesha, who wrote a book on ophthalmology, and another on nidananjana, a well-known book on the diagnosis of disease; and Harita who compiled Harita Samhita, a standard treatise on medicine, containing, among other things, a description of the blood and its circulation.

Ayur Veda is the most ancient system of Hindu medicine and can now only be seen in fragments. Sir William Jones, writing about it, says: "I have myself met with fragments of that primeval work, and in the Veda itself I found, with astonishment, an entire upanishad on the internal parts of the body with an examination of the nerves and arteries, a description of the heart, spleen, and liver, and various disquisitions on the formation and growth of the fœtus." Atreya Samhita is the oldest existing work on Hindu medicine, written by Atreya for the use of his pupils and containing 46,500 verses in all.

About the close of the Vedic period the Hindus attained a high degree of civilization, and cultivated medicine, surgery, materia medica, and chemistry. The surgeons accompanied kings to the battlefield, where they used surgical instruments, extracted foreign bodies, and dressed the wounds and applied bandages. The healing art was no longer confined to Brahmin priests, but a class of laymen called vaidyas came into existence, who specialized in medicine or surgery. Humoral pathology must have been known to the Hindus as early as this, as we find the three humours of the body mentioned in the Rig Veda (1, 34, 6).

The Epic Period (2500 to 1400 B.C.).—During the early part of this period the Hindu civilization continued to shine in all its splendour and

glory. It was the time depicted in the two great epic poems, the Ramayana and the Mahabarata. There was a physician attached to every court whose duty it was to look after the health of the king. The surgeons undertook major operations, both on the battlefield and in private practice. Schools of philosophy were opened where students were taught medicine and surgery. Dissection and vivisection were practised ; and chemistry was brought into practical use by the development of chemical arts, such as bleaching, dyeing, calico printing, tanning, soap and glass making, &c. The Hindu medicine flourished in all its branches. New drugs were added to the pharmacopœia by physicians who went out with their pupils to gather herbs and study their properties. Classical authors, such as Charaka, Susruta, make their appearance, whose works became the groundwork of succeeding Hindu writers for many centuries.

Pre-Buddhist Period (1400 to 500 B.C.).—This was the age of Hindu sutras and philosophic systems which later on attracted the illustrious men of Greece, such as Pythagoras, who visited the surmans of India, and took back with them Hindu philosophy and medicine, which they embodied in their schools and writings.

Buddhist Period (500 B.C. to 600 A.D.).—Buddha, by prohibiting animal sacrifices and the dissection of dead animals gave a death-blow to surgery, but medicine flourished. After Buddha's death, the pilgrims who came from all parts to visit the land of his birth returned with manuscripts of Hindu literature and medicine and translated them into their own tongues. While in India itself Indian medicine received the greatest support from King Asoka—the Indian Constantine—and his followers. Medical houses or hospitals were established for both men and animals in the north and western parts of India, and were provided with all sorts of instruments and medicines, consisting of mineral and vegetable drugs. Buddhist monks in different monasteries studied philosophy and medicine and fortified their spiritual ministry by becoming skilful physicians and relieving the suffering of the people.

When Alexander invaded India he found on all sides signs of advanced civilization. And Taxilles tried to conciliate the general by promising to send " a goblet of ruby and a philosopher of great knowledge and a physician who has such skill that he can restore the dead." Arrian tells us that Alexander brought with him many clever Greek physicians who were unable to cure snake-bites and other ailments, while the Indian physicians treated these cases with success. The Greek general was so struck with the skill of these vytians (physicians)

that he employed them in his camp and ordered his followers to consult them. Tradition says that at the end of his Indian campaign he took some of these learned vytians to Greece with him. These facts throw a sidelight on the state of Indian medicine, which must have been successfully carried on for centuries before it could have attained the advanced condition in which Alexander found it on his arrival in India in the fourth century B.C.

Arabian Period (600 to 1000 A.D.).—The Hindu medical works were greatly prized by the Arabians, whose intellectual activity was awakened after the death of Mahomed. Charaka, Susruta, and other Sanskrit literature were translated under the patronage of the caliphs, who made their court brilliant by gathering round them eminent men and philosophers of all nationalities, including Jews, Christains and Indians, and established a school at Bagdad, which attained a world-wide fame and influence. In the eighth century, and probably the ninth, Indians practised as physicians in Bagdad, and during the reign of Harun-al-Rashid they also lived at his court. Manka was a body physician to the caliph, cured him of a dangerous illness, and translated a work on poisons, by Charaka, into Persian.

The Arabian physicians who followed in the ninth and tenth centuries prescribed Indian drugs, and in their medical treatises made use of the Hindu authors and their works. For instance, Avicenna, in describing the treatment by leeches, begins by saying, " What the Indian says," and quotes the very words of Susruta in his description of six poisonous leeches. And what the Arabians learnt from the Hindu medical and scientific works they transmitted to the European physicians as late as the seventeenth century A.D.

The Mahomedan Period (1000 to 1500 A.D.).—The rise of the power of the Mahomedans at the heel of the Arabians marks the epoch of the sunset of Indian medicine, although even at the Mahomedan courts the vaidyans are reported to have cured many intractable diseases which had baffled the skill of their foreign rivals. While at the European period the Hindu medicine received its final death-blow.

(III)

DIFFERENT BRANCHES OF HINDU MEDICINE.

Now let us take a glance at the different branches of Hindu medicine.

Hygiene.—The Hindus paid great attention to hygiene, regimen of the body, and diet. The Hindu Shastras contain also a sanitary code :

and Manu, the great law-giver, was one of the greatest sanitary reformers the world has ever seen. The daily practice of early rising, of cleansing the teeth, anointing the oody, bathing, exercise, shampooing, and rubbing the body became part of their religious duties. Two meals a day and food taken sparingly, so as to rise from meals with the stomach partly empty, rinsing the mouth before and after meals, chewing of pan which contains aromatics and spices to stimulate gastric juice and remove fœtor from the mouth, were part of their daily system containing sound physiology. They understood the sanitary properties of oil, which was used not only for the purposes of consecration but also for guests and strangers, and also for health and cleanliness. They have a saying that " As serpents never go near an eagle, so diseases do not approach a person who is in the habit of taking physical exercise and anointing his limbs with oil." Shampooing (massage) was practised from time immemorial by the Hindus. It is said to accelerate the mind, cure diseased phlegm, wind and fat ; to diminish fatigue, increase internal heat, and bring on sleep. Both shampooing and anointing, used also by other ancient nations, such as Egyptians, Greeks, Romans, &c., were no doubt copied from the Hindus. Drinking and eating from the vessels of others, wearing shoes, clothes, or garlands used by others were considered a pollution, showing they had an idea of contamination so early in their period of history.

Chemistry.—In the Vedic period chemistry began as Rasayana, which was confined to fluid extracts and vegetable decoctions, and became merged into alchemy when the vegetable drugs were supplanted by mercury and metallic preparations. Though the Tantric cult and the worship of Siva (the third person of the Hindu Trinity) brought alchemy into prominence by identifying mercury with the elixir of life and philosopher's stone, chemistry made a gradual progress from the time of Charaka and Susruta. The ancient Hindus knew how to prepare sulphuric acid, nitric acid, and muriatic acid ; the oxides of copper, iron, lead (of which they had both the red oxide and litharge), tin and zinc ; the sulphuret of iron, copper, mercury, antimony and arsenic ; sulphate of copper, zinc and iron, and carbonate of lead and iron. The fact that Susruta gives a description of making caustic alkali from the ashes of plants, the originality of which very much struck M. Barthelot, is a proof of the high degree of perfection the Hindus achieved in scientific pharmacy at so early an age. The preparation of ammonia, of alkalies and their salts, nitric, hydrochloric and sulphuric acids, though rudely simple, is of great antiquity. They understood the

chemical processes of calcination, sublimation, distillation, and simple as was their apparatus, they distilled two of the most fragrant essences, the attar of rose and fragrant grass oil of Namur. The great metallurgist Patanjali (second century B.C.), in his treatise on metallurgy, gives elaborate directions for the preparation of metallic salts, alloys, amalgams, and the extraction, purification, and assaying of metals. Probably it was he who discovered the use of mixtures called Vidas, which contained aqua regia or other mineral acids in potentia. Though Charaka and Susruta mention mercury in their writings, Vagbhata mentions the use of mercury as a collyrium. Varahamihira (587 A.D.) gives mercury and iron among the aphrodisiacs and tonics. The metallurgist Nagarjuma (eighth century A.D.) advanced the knowledge of chemical compounds by his preparations of mercury. He was the first to introduce black sulphide of mercury. In the time of Vrinda (ninth century A.D.) and Chakrapani (tenth and eleventh centuries A.D.) the administration of mercury and its preparations was fully established, thus anticipating Paracelsus and his followers by several centuries. There can be no question as regards the priority of the Hindus in making mercury and its preparations a specialty, and administering them both externally and internally. In fact, among the ancients they were the only people who prescribed mercury internally, and the first to give mercury internally in syphilis. In the sixteenth century, when the Portuguese settled themselves in Goa and other parts of India, syphilis made its appearance. The Hindu physicians could not account for this disease, as all their medical writings from the time of Charaka and Susruta downwards were silent on the subject, while they gave accurate descriptions of other diseases of the genital organs. So they called it Phiranga Roga (Portuguese disease), and administered mercury in the form of calomel and by inunction. The term "Phiranga Roga" speaks volumes as to the origin of syphilis in India.

As for applied chemistry, Megasthenes says that Indians were early skilled in the arts. Among the chemical arts and manufactures which enabled India to command for more than one thousand years the markets of the East as well as of the West, there were three of the great Indian discoveries which secured to India an easy and universally recognized pre-eminence among the European nations of the world: (a) The preparation of fast dyes for textile fabrics; (b) the extraction of indigotin from the indigo plant; (c) the tempering of steel.

The art of dyeing was carried almost to perfection, the fast colours resembling the Tyrian purple. The blades of Damascus, so famous in

Persia and Arabia and all through the Middle Ages, were made of Indian steel, and manufactured in the workshops of Western India. The wrought iron pillar close to the Kutub, near Delhi, weighing 10 tons, and being 1,500 years old, the huge iron girders at Puri, the ornamental gates of Somnath, bear eloquent testimony to the marvellous metallurgical skill attained by the Hindus. Bleaching, dyeing, calico printing, tanning, soap and brass making, were some of the chemical arts known to the Hindus from high antiquity. They early attained perfection in copper and brass work, in gold and silver ornaments admired for delicacy and beauty, and in the weaving of cotton and muslin unrivalled for their softness of texture and exquisite fineness. Firearms of some kind were used in the early stage of Indian history : rockets (says Professor Wilson) appear to be of Indian invention. Varahamihira gives several preparations of cements, " strong as a thunderbolt," used in the temple architecture of the Buddhist period. The Vasavadatta and the Dasukumara Charita, in sixth century A.D., allude to the preparation of coagulated mercury ; a chemical powder to bring deep sleep, a chemically prepared stick for producing light without fire, and a powder like curare which paralyses the sensory and motor organs.

Pathology.—According to the Hindus the body is composed of five elements—wind, fire, water, earth and ether—having their respective qualities of dryness, sharpness, fluidity, heaviness and lightness. The humours of the body—wind, bile, and phlegm—are formed from the elements. The harmonious action of the elements and their qualities constitute health. The humours prepare the various actions of the body. When the humours become either corrupt or deranged they cause disease or death. So that to reduce the humours where they are abundant and increase them where they are wanting, to get the right proportion of elements in their humours, form the basis of cure among the Indians. This object is accomplished, in the first place, by the management of diet, strict regimen, and temperate life. If these fail, the deranged humours should be expelled by emetics, purgatives and blood-letting. Therefore the Hindu physicians used to prescribe emetics once a fortnight, a purgative once a month, and blood-letting twice a year at the change of seasons. There are certain seasons when the corrupted humours of the body are ripe for being evacuated, and this period of maturation of deranged humours was called the critical stage— the " crisis " of Hippocrates, the idea of which exists even to the present day. So then, the diseases of the body are the diseases of the various

humours. Medicine by increasing or decreasing the humours cures the diseases of the body, while the diseases of the mind are cured by reading the Shastras (scriptures), abstinence, leading a religious life, and various mortifications of the body. As the Hindu physicians saw that the blood was more generally affected by deranged humours causing disease, the derangement of blood as the fourth cause came to be added to the humoral theory, hence their enthusiasm in giving medicines, and local and general blood-letting to purify the blood. The fact that Hindu pathology was adopted by all the ancient nations and proved to be the basis of their medicine for many centuries shows that there must be a great deal of shrewd observation and common-sense underlying the principle. After all, Hindu pathology is not so absurd as it seems on the surface. The wind diseases of the ancients are diseases of the respiratory system, the diseases of bile correspond to the diseases of the circulatory system, while the derangements of phlegm come under the diseases of alimentary system. The humoral pathology, worked out at such an early period as the Rig Veda, shows that the Hindus were the teachers, not the learners from other nations.

The ancient Rishis of India went thoroughly into the diagnosis of a case, and were guided by the patient's appearance, eye, tongue, skin, pulse, voice, urine, and fæces. The examination of the pulse was considered the most important of all, and for this purpose the radial artery at the wrist was chosen. It is most striking to note the similarity of the description of the pulse as found in the ancient Sanskrit treatises and the doctrine of the theory of the pulse as taught by Galen, who had evidently derived his knowledge from the works of the ancient Indian physicians. They treated leprosy successfully; their cures of snake-bites astonished Alexander and the Greek physicians who accompanied him. Their attention to diet, fasting and temperate life cut short many a disease in its infancy. They treated almost every ailment by first prescribing purgatives; and intermittent fevers by arsenic, skin eruptions by arsenic and mercury. Their ideas and treatment of consumption seem very modern. They attributed the cause of consumption to excessive grief, great fatigue, a diminution of mental and bodily strength, violent exercise, excessive venery, and treated it with animal food, ghee (clarified butter) of goats and sheep, with barley, prepared barley, flour and rice with animal broths, a mixture of ghee, honey and pepper, garlic, fumes of turpentine and pine, &c., and recommended the patient to live in the same room with goats. The treatment of many other diseases besides consumption is similar to that of the West.

Anatomy.—The Hindus were the first to practise the dissection of the human body. Both Charaka and Susruta insist that the knowledge of practical anatomy is essential to be a practitioner. The body to be dissected was first washed, placed in still water in a moving stream for seven days and then taken out and each layer examined before being removed, beginning with the skin. Charaka gives 306 bones and Susruta 300 in the human body (the difference is in the counting of the cartilage with the bones), 500 muscles, of which 400 are in the extremities and the remainder in the trunk and head, 107 articulations, 210 joints, 68 movable and 142 immovable, 8 forms of joints, 900 ligaments, of which 600 are in the extremities, 230 in the trunk and 70 in the neck and head. The Hindus believed that from the navel all the blood-vessels proceed and that it is the principal seat of life (prana). Susruta enumerates 40 principal vessels with 700 branches ; 10 contain wind (hence artery means carrier of air), 10 bile, 10 phlegm, and 10 blood. Blood nourishes all the other essential parts of the body.

Digestion and Circulation.—The Hindus held that the food we eat goes down by the action of bi-motor force (prana vayu) into the gullet and stomach, where it becomes mixed up first with gelatinous mucus, which has a saccharine taste, and then acidulated by the further action of digestive juice (evidently gastric juice), and goes down the pitta sayu (duodenum), into which bile comes down from the liver, and then into the small intestine. There the bile acts on the chyme and converts it into chyle. The essence of chyle from the small intestine is driven by the bi-motor force (prana vayu) along with the dhamni trunk (the thoracic duct) first to the heart and then to the liver, where the colouring matter in the bile acts on the essence of chyle and imparts to it a red pigment, transforming it into blood. The circulation of the blood is distinctly understood by Charaka, Susruta, Dalvana, Bhanumati, &c., as we read that "the heart which receives and then sends down the chyle through the dhamanies and gets it back transformed into blood." To them the circulation of the chyle was really identical with the circulation of the blood, as they argued that chyle or rasa is blood without the colouring ingredient. Harita, who is older than Susruta, in describing anæmia as caused by swallowing clay, says, "The clay thus eaten blocks the lumen of the several veins and stops the circulation of the blood." Bhavamisra, who was centuries older than Harvey, quotes another author thus : "Blood by circulating through its vessels fills

the dhatus well, causes perception, and performs other functions (of nourishing and strengthening)."

Surgery forms the first chapter in the Ayur Vada, and Susruta says that "it (surgery) was the first and best of the medical sciences; less liable than any others to the fallacy and conjectural and inferential practice, pure in itself, perpetual in its applicability, the worthy place of heaven, and certain source of fame." The ancient Hindu practitioners were bold and expert surgeons and performed cystotomy, lithotomy, embryotomy, and couched for cataract. There were three modes adopted by the Hindus for treating surgical cases— by cutting instruments, by caustics, and by actual cautery. In the opinion of Susruta caustic is better than the knife and the cautery better than either. The earliest surgical works mention no fewer than 125 surgical instruments for ophthalmic, obstetric and other operations, which shows how carefully they studied surgery. They set fractures and dislocations in men and beasts, reduced hernia, cured piles and fistula-in-ano, and extracted foreign bodies. They performed amputations and abdominal section. They were experts in rhinoplastic operations, which were practised for ages in India. As Dr. Hirschberg says : " The whole plastic surgery in Europe had taken its new flight when these cunning devices of Indian workmen became known to us. The transplanting of sensible skin flaps is also an entirely Indian method." The Hindu teachers gave practical instruction on surgery to their pupils. The different surgical operations were shown to the students upon wax spread out upon a board, on gourds, cucumbers, and other soft fruits; tapping and puncturing was practised on a leather bag of water or of soft mud; scarification on the fresh hides of animals on which the hair was allowed to remain ; venesection on the vessels of dead animals and on the stalks of water lilies; the art of probing and stuffing on bamboo, reed, and cavities of wood; suturing on pieces of cloth, skin or hide; ligatures and bandages on well-made models of human limbs; application of caustics and the actual cautery on pieces of flesh ; catheterization on an unbaked earthern vessel filled with water ; and the extraction of teeth upon dead bodies of animals. When operation was decided on, an auspicious day was selected, and a clean and well-lighted room was chosen, instruments arranged so as to be at hand when required, with bandages, lint, honey, ghee, hot and cold water, &c. The patient faced the east, the surgeon the west. Incense was kept burning in the operation room, thus foreshadowing the germ theory of the

present day. In serious or painful operations the patient was made insensible by anæsthetics, lint smeared with honey or ghee placed upon the wound and bandages applied to the part. The dread of hæmorrhage did not deter the Hindu surgeons from amputating a limb under urgent circumstances. In these cases boiling oil was applied to the stump ; with pressure by means of a cup-formed bandage to arrest the bleeding ; pitch also appears to have been added to assist in stopping the blood.

To give an instance of their cleverness in brain surgery, King Bhoga of Dhar (977 A.D.) was suffering from a severe pain in the head which baffled all medical treatment. While his condition became critical it so happened that two brother physicians arrived in Dhar at that time, who after careful examination considered an operation was necessary. Accordingly under the influence of an anæsthetic (Samohini) they trephined the skull, removed from the brain the real cause of the complaint, closed the opening, stitched the wound and applied a healing balm. The royal patient got completely well.

The art of surgery began to be neglected after the death of Buddha, and medicine after the Mahomedan invasion, and both declined after the European conquest of India. But by that time Hindu medicine had accomplished its task, and though practically dead, it lives in the younger civilizations of other nations and other countries. As in other branches of science, Hindu medicine was permeated with the spirit of philosophy and religion. To the Hindus Brahma was the first physician, and atma (soul) was of supreme importance. They reasoned from mind to matter, and treated man as a whole, body, mind and spirit ; hence the Brahmins combined the offices of physician, philosopher and priest. Their love of philosophy and metaphysical speculations often clouded their rational conclusions ; but their keen observation of Nature and by the bedside of the patients made them great in diagnosis and treatment. Their fertile imagination soared so high that it often outran reason ; but they prescribed a strict regimen, a simple life and mental rest to their patients ; while they directed them to the source of all peace—the basis of all cure and the want of which the cause of all disease. If the West had a little more of the spirit of philosophy and faith of the East, it would have saved her many a disappointment and many a false conclusion with which her path of research is so thickly strewn. It would give her a wider outlook, a larger vision, so that she could look beyond the material and physical bases of life to those hidden forces and agencies for the cause and treatment of disease.

The Hospital and Chapel of Saint Mary Roncevall at Charing Cross.

By James Galloway, M.D.

" En Rencesvals si est Carles entrez ;

    •   •   •   •

Rollanz remeint pur les altres guarder.

    •   •   •   •

Halt sunt li pui e tenebrus e grant,
Li val parfunt e les ewes curranz.

    •   •   •   •

Li gentilz quens, qu'il fut morz cunquerant."
    —"La Chanson de Roland," édition, Léon Gautier.

The fact that the conventual Hospital of St. Mary Roncevall was founded at the village of Charing in the time of Henry III, and that it continued to exist till the dissolution of the religious houses by Henry VIII, is well known to students of the history of London ; but, so far as the writer is aware, no definite attempt had been made to collect the remaining records of this interesting medical foundation before 1907, when the story of the Convent and its Hospital was published privately.[1] Nevertheless, the influence of the Convent and the Hospital which it established was considerable during the three centuries of their existence in England. The name which the Convent in London received from the Mother House served to revive the memories of perilous journeys and of timely succour in the minds of many who had travelled abroad in France and Spain, engaged either in warlike or peaceful affairs, the name of Roncevall in many forms came to be used as a family designation in various parts of England,[2] and Chaucer refers to the existence of the Convent in a way that shows that the reference required no explanation to his readers.

After the dissolution of the alien priories the fraternity owed its continued existence to the recognition of the charitable assistance it

[1] Galloway, James, "The Story of Saint Mary Roncevall," private publication ; and *Charing Cross Hosp. Gaz.*, 1907, ix, p. 43. Cf. references by Dugdale, "Monasticon Anglicanum," ed. 1830 ; Newcourt, "Repertorium Ecclesiasticum Parochiale Londinense," 1708 ; Tanner, "Notitia Monastica," 1744 ; also by Stow and later writers on London.

[2] The records of the painful dispute between the Abbot of Rewley and John Ronceval and his associates, John, Thomas, and Walter Rounceval may be yet read with interest.—Calend. Pat. Rolls. 16 Ed. II and 14 Ed. III. (1323-41.)

rendered to " the poor people flocking to the Hospital." This attempt, therefore, to fill up a gap in the history of the London hospitals may be of some interest to the Historical Section of the Royal Society of Medicine.

RONCESVALLES.

There are few places so renowned in the early literature of the Romance languages as the pass through the Western Pyrenees, at the southern extremity of which lies the village of Roncesvalles. The Song of Roland handed down the memories of Roncesvalles from the early Middle Ages; but this famous poem (dating in its present form from the latter part of the eleventh century) must be regarded only as the final and successful effort to collect the traditions which form the foundations of French and Spanish history. The traditions find their earliest record in the legends and " chansons de geste," which, in the first instance, served to commemorate the successful rising of the people of Spain to expel an invader, Charlemagne, the Emperor of the North. The rearguard of his retreating host, consisting chiefly of Frankish subjects of the Emperor under the leadership of the Count Roland, Captain-General of the Breton March, the Emperor's nephew, was overwhelmed and annihilated, while traversing the Pass on their retreat from Spain in the year 778. The ancient history of Eginhard, telling of the Spaniards, says very suggestively " usque ad unum omnes interficiunt ac . . . summa cum celeritate in diversa disperguntur." Even " li gentilz quens " did not escape the massacre. The Chanson de Roland gives the French version of this tradition, which was accepted by the Normans in England ; the Spanish legend of the hero Bernardo del Carpio gives, as it is to be expected, a very different account of the overthrow of the Emperor.

In the course of the succeeding centuries the Pass of Roncesvalles occupies on more than one occasion a prominent place in British history. One of the most picturesque passages in Froissart tells how the army of Edward the Black Prince traversed the Pass in the ill-omened invasion of Spain that led to his fatal illness. His remarkable victory at Navarrete scarcely relieves the gloomy record of this adventure. Little more than one hundred years have elapsed since Roncesvalles and the neighbouring defiles once more saw the advance of war-worn British soldiery. In the defence of these passes against the advance of the French under Soult, so nearly successful in overwhelming Wellington's right flank, and in the subsequent pursuit of
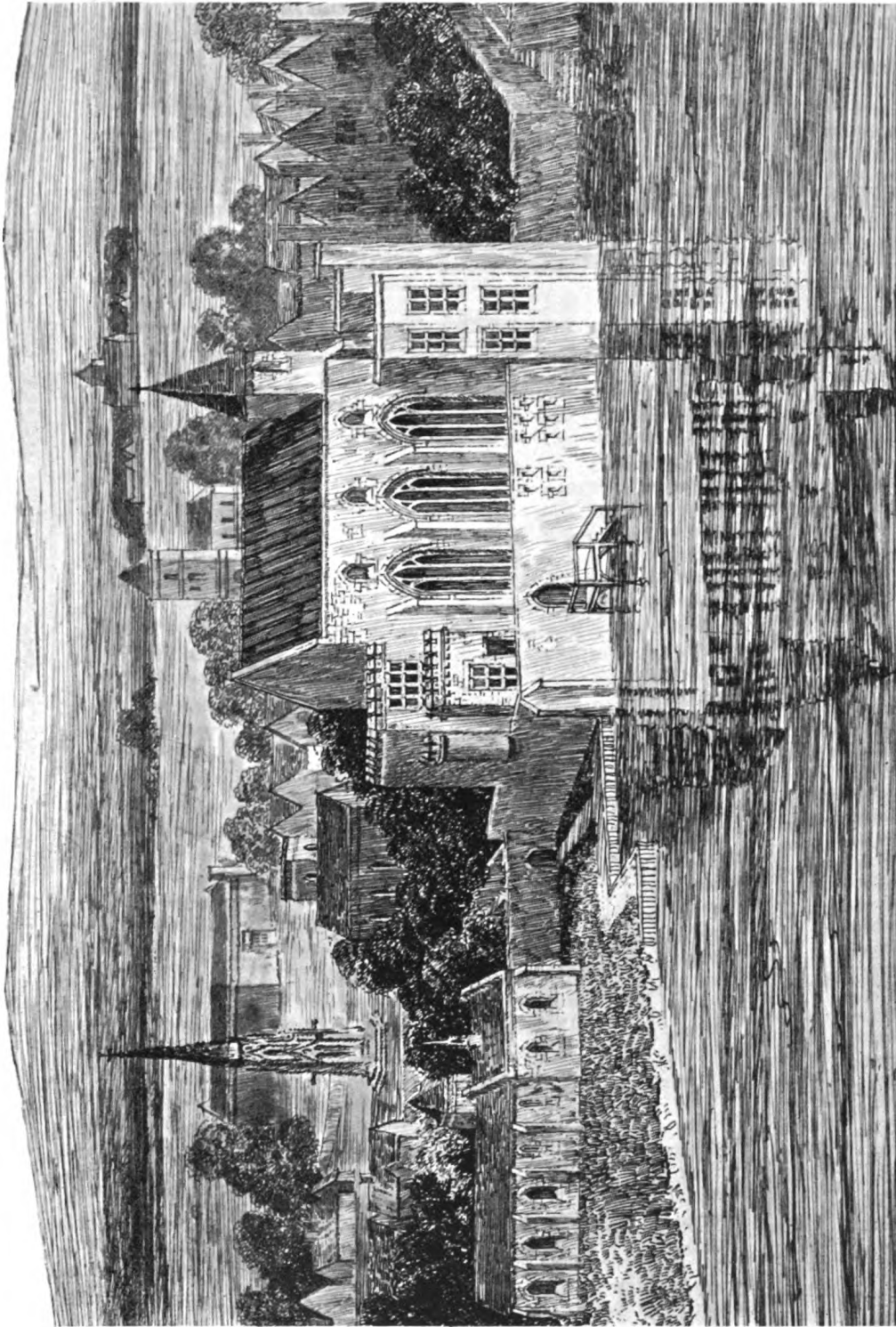
Fig. 1.

Charing Cross and the Chapel of St. Mary Roncevall in the early part of the sixteenth century. (After Van den Wyngaerde, and from other sources of information.)

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the retreating French armies, some of the most remarkable of the feats of arms which distinguished the Peninsular War took place. British military history contains few more stirring episodes than the combats between the French and the allied troops in the Passes of Maya and Roncesvalles.
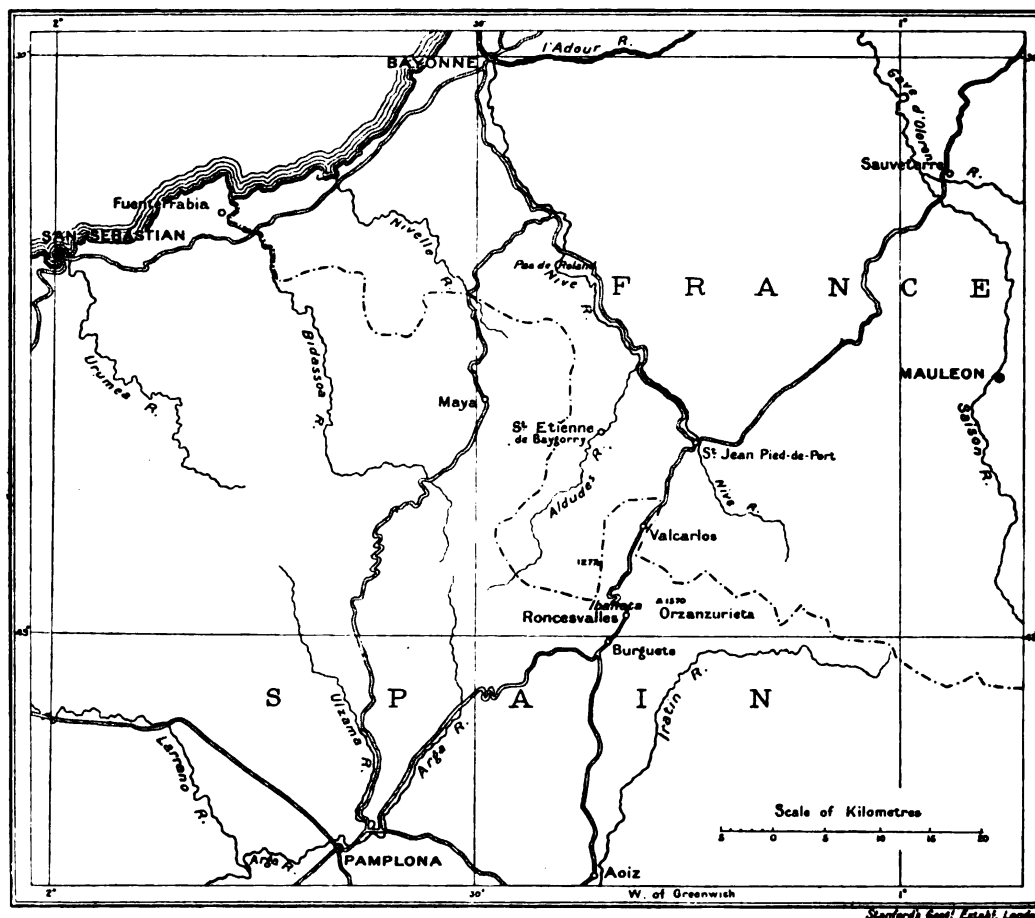
Fɪɢ. 2.

A chart of the Western Pyrenees, showing the roads through the passes and the position of Roncesvalles and Ibañeta.

The memories of Roncesvalles, therefore, are in no danger of being forgotten, but it has passed from knowledge that for a period of more than three hundred years the name of Roncesvalles was more familiar to the citizens of Westminster and London than to the dwellers in Pamplona and Bayonne. How it came about that an important

religious house dedicated to Our Lady of Roncesvalles should have been established at Charing will best be understood if we consider the nature of the activities of the ancient Monastery in the Pass of Roncesvalles, the numbers of those on whom it conferred benefits, and the character of its benefactors in England.

The Convent of St. Mary Roncesvalles in Navarre.

From very early Christian times a religious house, no doubt very small in its beginnings, was situated near the top of the pass through which runs the ancient road over the Pyrenees leading from Pamplona in Navarre, through the mountains by St. Jean Pied-de-Port, to Bayonne and Bordeaux. The religious community at this place received its most important support from Charlemagne himself, when he established a religious house intended to be a memorial of Roland and his comrades in arms. The original Convent of Charlemagne's foundation was situated close to the village of Ibañeta, near the summit of the Pass and the site of the great battle. Of this house only insignificant and deserted ruins remain. After a destructive raid by the Moors under Abderramen, Caliph of Cordova, in 921, the community removed to the present site of the Monastery in the village of Roncesvalles, two or three kilometres farther south. The removal of the Convent to this site is said to have been determined by various miraculous signs, among others by the discovery of an image of the Holy Virgin, and it was clearly to the advantage of the community that its permanent settlement should be in the comparatively sheltered southern approaches of the Pass rather than on the exposed summit.

The Order of Roncesvalles thus became established on a firmer basis, and at first had distinct military as well as religious purposes. The members of the community consisted of knights and companions, as well as the brothers and sisters, who all bore the badge of the Order. The duties which they had to fulfil were military, for the Knights of Roncesvalles were in frequent conflict with the Moors, and religious, for not only did the brethren serve their Church, but one of the earliest and most important duties of the community was to establish a hospital in the Pass for wayfarers in this wild region.

In the course of time the members of this military-religious community received the Augustinian Rule, but they retained much of their independence, the memories of their original order, and especially held to the traditions of hospitality and charitable succour to pilgrims and

to those in distress.   The Convent and its Hospital gradually acquired wide renown on account of the good works carried on by the Canons. Their house was on the main road between France and Spain. The military expeditions so frequently traversing the frontiers marched along the highway passing its doors, pilgrims visiting the shrine of St. James at Compostella must have halted there on their way to and from the south, and the road through the Pass was the chief highway for peaceful travellers of every kind.   The community, therefore, increased in importance and in wealth by gifts from princes, nobles, knights, and the common folk, and came to possess property not only in Spain, but also in Portugal, Italy and in France, and, as the records show, in England and Wales, in Ireland, and in Scotland. It is stated that at the height of its prosperity the Convent distributed annually from 25,000 to 30,000 rations, each consisting of a loaf of 16 oz., half a pint of wine, with sufficient soup and meat, or fish on days of fast.   Those who were infirm had chicken broth and mutton. The Hospital had a staff consisting of the physicians, with whom were associated surgeons and an apothecary, and one of the distinguishing features of the Order at a very early period was that it included sisters. In the case of patients dying while in hospital, free interment was given after the celebration of masses in due form.   It is expressly stated that the daughter house in England, with its possessions in that country, in Ireland, and in Scotland, remitted annually the sum of 4,000 ducats for the support of the Mother House at Roncesvalles.

During the fifteenth and sixteenth centuries the community of Roncesvalles fell on evil days.   The march of events deprived them of their property abroad, while laxity in the observance of their Rule and the continually disturbed state of the Franco-Spanish frontier brought about the loss of the greater part of their accumulated possessions and wealth.[1]   Unfortunately the ancient records of the Monastery have nearly all been destroyed; but there remains in the library an unpublished manuscript giving the history of the Order and the Convent, written by Don Juan Huarte, about the middle of the seventeenth century, which incorporates information received from a certain Don Francisco Olastro[2] (who is stated to have been an ambassador from England in Madrid) respecting the history of their daughter house in London.   But even at the time when this document was written, many

[1] Cf. Reseña histórica de la Real Casa de nuestra Señora de Roncesvalles ; por D. Hilario Sarasa, Pamplona, 1878; a review was published by Wentworth Webster in the " Academy," 1879, xvi, p. 135-6.

[2] ? Francis Oliver.

statements it contains appear to have acquired the characteristics of tradition and can be accepted only after careful collation and criticism. We have, therefore, to depend almost entirely on the English records or the history of the House of Roncesvalles in London.

THE CONVENT OF SAINT MARY RONCEVALL AT CHARING.

To understand how it was possible that a religious house in the Pyrenees could hold possessions scattered throughout so many different lands, it must be clearly borne in mind that in the Middle Ages the rule exercised by the Church took very little cognizance of State limits. The ecclesiastical power was much stronger than the national influences of the time, and the Church drew its revenues from all Christian countries, quite irrespective of political boundaries. At the time when the House of Roncesvalles at Charing was founded, the overlordship of the Pope had been felt in England and in France in a very real manner. In addition to this ecclesiastical bond, the political relationships between England, France and Northern Spain were of the most intimate character, so that the all-pervading power of the Church could be exercised with the greater ease in these countries. During the period of the Norman, and even more so during the Angevin dynasty, the English barons experienced the greatest difficulty in detaching themselves from the influences exerted on them by their foreign relationships, even if they had the desire to do so. In many cases they seem to have frankly regarded their insular possessions as sources of revenue and power to be made use of in order to promote their Continental interests. In this respect they followed the example set in such unmistakable fashion by kings such as Richard and John. The Church acted in the same manner, and many foreign convents were able, by their powerful influence, to obtain possession of, and to exploit, the rich lands of England for their own support. It was not until the close of the reign of John and during the reign of Henry III that the separate destinies of England and France became apparent to the more sagacious of the English statesmen of that period. It is very instructive, therefore, to note as evidence of the complicated and distracting political and social influences still felt by the English magnates, that the noble family which perhaps most of all by its example and advice sought to uphold the political independence of England as apart from France, was nevertheless impelled to become one of the great benefactors of a foreign religious house.

WILLIAM MARSHALL, EARL OF PEMBROKE (1219-31), FOUNDER OF
ST. MARY RONCEVALL.

The House of Roncesvalles appears to have owed most of its
property in England and in Ireland to the liberality of William
Marshall, Earl of Pembroke, the eldest son of the great William
Marshall—*Rector regis et regni*—the Protector of the King and his
kingdom after the death of John. The elder Marshall stands out in
conspicuous fashion as the most steadfast of all the advisers of the
king during the dark period coinciding with the reigns of Richard I
and John. His early years were passed in France, acquiring skill in
the martial exercises commonly practised by the young nobles of the
day, and his courage and proficiency in arms were such that he had
early acquired the reputation of being one of the most redoubtable
knights in Christendom. If no other evidence remained of his prowess,
the historic passage of arms against Richard Cœur de Lion while still
Count of Poitiers will be sufficient proof.[1] On this occasion he over-
threw Richard and held him at his mercy, preventing the mad attack
on his father, and probably saved the Prince from the fate of being
a parricide. In addition to his skill in the use of arms, he gradu-
ally built up for himself a reputation for prudence, sagacity and
loyalty, so that while still a young man he was entrusted with the
guardianship of the young Henry, son of Henry II, and in the
succeeding reigns occupied the most prominent positions under the
English Crown, trusted by the barons and even by John. The
testimony of the French King Philip Augustus, when informed of the
death of William Marshall, as to his reputation for loyalty and honour

[1] " Al conte Richard ki vencit.
　　E quant li quens le vit venir
　　Si s'escria par grant haïr :
　　' Par les gambes Dieu ! Maréchal
　　Ne m'ociez ; ce sereit mal.
　　Ge sui toz desarmes issi.'
　　Et li Maréchal respondi :
　　' Nenil ! diables vos ocie !
　　Cor jo ne vos ocirai mie.' "

—" L'Histoire de Guillaume le Maréchal," 8836-8844 ; publié pour la
Société de l'Histoire de France par Paul Meyer.

remains on record : " Et, en vérité le Maréchal fut l'homme le plus ˋ
loyal que j'aie jamais connu." [1]

During the many years of William Marshall's residence abroad
he travelled widely throughout France and no doubt in Northern
Spain. It is well known that he went on pilgrimage to the Holy
Sepulchre in fulfilment of a promise given to the young Henry on his
deathbed. Marshall must have been very familar with the reputation
of the Monastery at Roncesvalles. There can be little doubt that he
had passed it on his journeyings ; the military-religious character of
its Rule would have appealed to him, and he may even have rested in
the House of, the Convent. His piety is evidenced by the fact that he
became closely associated with the Order of the Knights Templars,
was one of their great benefactors in England, and at his death received
sepulture in their church, then newly built in London.

The elder Marshall died in the year 1219, and was succeeded by
his eldest son, also called William, who then became possessed of one
of the most extensive heritages in England, for the English and
Welsh lands of the Clares, Earls of Pembroke, and in addition their
great Irish inheritance in Leinster, had come into the possession of
the Marshall family.

What we know of the son shows him to have been a man of
much the same type as his father—probably not so rugged, but with
the same steadfast ideals of loyal conduct. It is evident that his
character was as strongly tinctured with religious feeling as was that
of his father. He also was an Associate of the Order of the Knights
Templars, and was one of their principal supporters after their
removal to the " New Temple," where the " Temple " Church still
stands. His admiration for his father is clearly shown by the price-
less biography of the elder William which we still possess. This
poem is known as " L'Histoire de Guillaume le Maréchal " and is
evidently the work of a professional writer of the period, but it
was composed under the direction of the son of the great Marshall
with the assistance of Jean d'Erleé,[2] his father's old companion and
faithful squire.

[1] " Dist li reis ' mes li Maréchal
Fu, al mien dit, li plus leials,
Veir, que jeo unques coneusse
En nul liu ou je unques fusse."
—" L'Histoire de Guillaume le Maréchal," 19149-19152.

[2] Erlée ; Earley (Erleia, Erlegh, &c.), near Reading.

During the lifetime of William Marshall and his son, and for long before and after, the high road through the Pass of Roncesvalles was much frequented. It was the main line of communication by land between France and Spain on the western frontier, and was

FIG. 3.   FIG. 4.

Figs. 3 and 4.—Front and profile views of the effigy in the Temple Church of William Marshall, sen., Earl of Pembroke (*ob.* 1219).

used both by peaceful travellers and by the numerous military expeditions passing from one country to the other. These expeditions resulted not only from the constant warfare of the border but were also organized by Crusaders on their way to help the Spaniard

against the Moor, frequently with the purpose of travelling farther to
the Holy Land. At this time also the relationships formed by
Henry II and his sons with the Courts of the new kingdoms in
the north of Spain, which were beginning to arise as the tide of

FIG. 5.   FIG. 6.   FIG. 7.

Figs. 5, 6, and 7.—Front and profile views of the effigy in the Temple Church
of William Marshall, jun., Earl of Pembroke (*ob.* 1231).

Moorish invasion receded, were of the most intimate character. It will
be remembered that Richard, when King of England, married Beren-
garia, daughter of Sancho VI of Navarre, after a very troublesome

wooing, and that the younger Sancho took the part of Richard while the latter was on crusade against their common enemies in the South of France. The relationship between the Courts of Aragon and Castile and the Angevin Kings was no less intimate. William Marshall and his eldest son were in the closest association with the Royal House. They both travelled far and wide over France and Northern Spain, so that the Angevin dominions in Aquitaine and the neighbouring kingdom of Navarre must at one time have been as well known to the Marshall family as their home in England.

Another reason which brought many travellers along the road through Roncesvalles was the attraction of the Shrine of St. James at Compostella. The pilgrimage to Compostella was undertaken by knights and their squires as the result of vows made on the field of battle, and was famed for its efficacy among all engaged in military affairs. But the pilgrimage even to armed bands was a dangerous one on account of the disturbed state of the frontier. An interesting example of this is presented in the relationships between Richard and his neighbour the Count of Toulouse. The ostensible cause for Richard's warfare against the Count of Toulouse was the inveterate inclination of the latter to acts of brigandage. When war was declared the Count of Toulouse had actually captured and ill-treated two English knights named Robert le Poer and Ralph Fraser, on their return from a pilgrimage to Compostella. The reputation of the Hospital of St. Mary in the Pass of Roncesvalles and of the Convent which supported the Hospital was known to every traveller—peaceful or warlike—in Western Europe, and would certainly have appealed to the benevolence of such a man as the younger William Marshall. The probability is that both father and son had stronger motives for giving alms to the Community—the result of benefits received from the Convent and Hospital during their journeys between France and Spain.

The Coming of the Brethren to England (1229) and the Foundation of the Convent at Charing.

The first knowledge we have of the presence in England of members of the Community of Roncesvalles is obtained from the letters of protection given to certain brethren by Henry III, in the year 1229. These letters were of the usual complete character, and it is clear that the intention of the deputation from Roncesvalles was to seek alms in

England for the support of their House in the remote valley in the Pyrenees. This purpose was definitely encouraged by a special clause in the letters of protection.

The brethren seem to have been taken under the patronage of the younger William Marshall from the beginning. They may even have come to England on his invitation, for we find that he soon commenced to make arrangements to give them revenues and an establishment in this country. Very unfortunately for the Convent, the Earl died in the year 1231, soon after his return to England from Henry's disastrous campaign in Poitou and Brittany, where he had held the chief command. But the record of his great gift remains, for on August 11, 1232, Henry confirmed at Wenlock " the grant to Saint Mary and the Hospital at Roncevaux (*Roscida Vallis*) of the gift which William Marshall, some- time Earl of Pembroke, made to them of all his houses at Cherring, and the houses and curtilages adjoining them formerly belonging to William Briwere, and of 100*s.* at Suthanton payable from the houses of the said Earl there, of 13*l.* of land in Netherwent in the moor of Magor, and of a carucate of land in Assandon, which he bought from Robert de Rochford."

It was thus in consequence of the munificence of William Marshall the younger that the brethren of Roncesvalles obtained the land on the banks of the Thames at Charing where they subsequently built their conventual dwelling, their Hospital for the sick, and the Chapel by the riverside, which were to remain an important feature of London for over three hundred years.

SAINT MARY RONCEVALL TO THE YEAR 1348.

The records of this alien settlement for many years consist mainly of statements of the gifts received from various important persons. The community seems to have flourished, and their work, both in London and in the Pyrenees, continued to deserve the sympathy and support of their pious benefactors. There is evidence that they possessed property in Norwich, Canterbury, Oxford, Pevensey, Southampton, and elsewhere, and that they received certain revenues from Ireland and from Scotland. It is easy to understand that their Irish revenues may have been considerable on account of the great estates possessed by the Marshall family in Leinster. It is clear also that the Convent had the advantage of royal favour and patronage, for the English records contain several confirmations of valuable gifts from both Henry III and Edward I,

derived from royal property situated in the South of France, to the mother house in the Pyrenees.   One of the most interesting of these gifts is the rent to be derived for the benefit of the Convent from the King's lands in the town of Myramand, previously granted to Eleanor, the Queen Mother.   This grant is specially mentioned in the same document as another endowment derived from the same source to be paid to the Abbey of Fontevraud.   This benefaction to the House of Roncesvalles gives the measure of respect in which it was held, for an English king who placed the house of Roncesvalles in the same category as the Abbey of Fontevraud as worthy of support must have felt the claims of the Convent in the Pyrenees in the strongest possible way.   Edward's Angevin ancestors had been buried in the Church of Fontevraud for generations, and there was no ecclesiastical foundation possessing a greater claim on the munificence of the Angevin family than this Abbey.

The little that is known of the domestic progress of the House at Charing, in addition to such general indications as are given· of its financial condition, concerns the appointment of certain officials.   In the year 1278, and again in 1280, a certain Henry, son of William of Smalebrook, was appointed as his attorney for two years on each occasion by the Prior of the Hospital of Roncesvalles.   The inference to be derived from this is that the weakness inherent in all the alien houses had already begun to show itself in the community at Charing. The management of the estates in England was entrusted to agents in this country, with the consequence that maladministration of their affairs was very apt to take place,[1] and, as a result, opportunities frequently arose for the interference of neighbouring magnates or of the King himself with the affairs of the alien religious houses.

Complications of this nature must have taken place about this time at the House at Charing.   In the year 1283 a certain Brother Lupus appears upon the scene for the first time.   His position in England seems to have been that of envoy coming from the Pope, but in the same record he is described as a priest, envoy and preceptor of the Houses in England and Ireland of the Prior and Convent of the Hospital of St.

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[1] An instructive example is afforded by the exploits of Ralph de "Runcevill," who is stigmatized as a vagabond monk, but who was nevertheless strong enough to retain possession of the Priory of Goldcliff in the Marches of Wales (near Newport, Monmouthshire) in spite of the efforts of his superior the Abbot of the very important Convent of Bec-Hellouin in Normandy, of which the House at Goldcliff was a "Cell," "Calend. Pat. Rolls," 12-14, Ed. II, (1319-1321).

Mary Roncesvalles, and he no doubt had instructions to supervise the management of their estates. The arrival of Brother Lupus, "streight comen fro the court of Rome," with indulgences for the remission of sins, is an interesting proof that even so early as the year 1283 the sale of indulgences was one of the special functions of the brethren of Roncesvalles, and was no doubt a source of considerable income to the Priory. Chaucer, writing a hundred years later, alludes, in his characteristic ironical manner, to this side of the activities of the Canons of Roncesvalles;[1] and even so late as the year 1432, when the House in London had come under the influence of the English clergy, a special effort was made to preserve this source of profit.

The year 1290 must have been notable in the annals of the Hospital, for in that year died Eleanor of Castile, the wife of Edward I, at Harby, near Lincoln, and the King in pious memory built a sculptured cross at every place where the body of his consort rested during the funeral procession to Westminster. The last station in this progress was at the village of Charing. The hospitality of the brethren must have been taxed to the utmost to provide accommodation for the retinue accompanying the King, even if supplemented by the exertions of the neighbouring hermitage of St. Catherine. The cross at Charing was completed in the year 1294, and the brethren no doubt at this time had many opportunities of conversing with the artists and handicraftsmen who formed the very flourishing and remarkable school of art at Westminster, and who were so enthusiastically encouraged both by Henry III and his son Edward. It is quite possible that the Chapel of the Convent may have benefited by the advice, or even by the workmanship of Alexander "the Imaginator," of Abingdon, and William de Ireland, whose artistic handiwork formed so prominent a feature of the Eleanor Crosses.

The next records show that officials with foreign names are in charge of the estate of Roncesvalles in England. In 1292 William de

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[1] " A Somner was ther with us in that place,
    That had a fyr-reed cherubinnes face."
        •   •   •   •
" With him ther rood a gentil Pardoner
    Of Rouncival, his freend and his compeer,
    That streight was comen fro the court of Rome.
    Ful loude he song ' Com hider, love, to me.'
    This somnour bar to him a stiff burdoun,
    Was never trompe of half so greet a soun."

    —The Prologue to the " Canterbury Tales " (Dr. Skeat's edition).

Cestre and Peter Arnaldi de Santo Michaele are nominated attorneys for five years for the Prior then staying beyond seas, and again, the following year, we find Lupus de Canone concerned in the management of the Roncesvalles property, having a lay person, Arnaldus de Sancto Johanne, associated with him.

Evidence of the vigour displayed by Brother Lupus in his administration of the affairs of the Convent occurs in an entry in the statement of accounts drawn up by the Executors of Queen Eleanor. It gives the information that the Executors paid the comparatively large sum of 14*l.* 2*s.* to Brother Lupus, Procurator of the Hospital of Roncesvalles, as damages claimed by the brethren on account of their houses at Southampton. This payment was made in the year 1291, and not only indicates that the estate of Roncesvalles in England was being watchfully managed, but also gives us the information that the Convent still possessed the property at Southampton, originally conveyed to them in the foundation-gift of William Marshall.

The brethren of St. Mary of Roncesvalles at Charing did not fail to defend their rights when unjust inroads were made on their property. There are indications that efforts, stimulated no doubt by the Mother House, were made after periods of lax management—numerous in the troubled times that followed—to repossess themselves of the rents and property seized by powerful neighbours. These .efforts were in many cases successful, partly by the good will of charitably disposed persons, partly by the influence of the Crown, but mainly by the sturdy support of the rights of their House before the King's Court.

In the year 1294, the Prior of the Hospital claimed, by writ of entry, one toft with appurtenances in Westminster from Adam, son of Walter the Scot. It was admitted that the toft and tenements had been held fifteen years previously by the Prior, who had lost them by default, as he did not appear before the Court when the ownership of the property was in question. The Convent made good its claim, though it seems that Adam was quite willing to restore the property to the Convent, but a special inquiry had to be made to show that there was no collusion in permitting this property to pass in mortmain to the religious house. It is of interest to note that the Prior, Garcia de Ochoa, died in November, 1278, and was succeeded by the Prior Juan. In the year 1279, when this property passed by default, difficulties may have arisen on account of an interregnum at Roncesvalles.

To this period an incident should probably be referred to which attention is drawn in an undated petition from the Prior, requesting

that property lying before the Cross at Charing, to the extent of 3 acres, and certain rents, should be restored. This property had been held for a period of ten years by a certain John of Lincoln, Burgess of London, and on his death had passed into the hands of the King on account of default on the part of the Attorney of the Prior and Convent. This petition quaintly recites as part of the evidence that the property belonged to the Convent, that the fact was a matter of common knowledge, "come les gentz dil pais le sauont bien et toute la veisinetee." The little incident has a strong resemblance to other successful claims for their lost lands made under the stimulating influence of Brother Lupus.

During the troubled times when England was engaged in Continental wars, soon to become almost continuous, communication between Gascony and England must have been so difficult as to be well-nigh impossible to men of peace. Convoys under military protection were in imminent danger of capture, and from what we know, especially in the case of naval warfare at this period, there were few of the vanquished who escaped death. In addition to the dangers of travelling another source of great difficulty was felt by the Prior and his officials. The King was in constant and urgent need of money to permit of the prosecution of his warlike policy, and his agents were not too scrupulous as to how it was obtained. If it could be represented that the property of the alien religious houses in the King's dominions could be used for the support of his enemies abroad, or if it could be urged in extenuation that funds sent abroad by the alien communities could be captured in transit, it is evident that the King would have many excuses and would exercise little scruple in levying heavy contributions on the property of the alien clergy in this country, or even of confiscating it entirely. It was under these conditions that the earliest suppressions and confiscations of the alien houses took place.

In 1321 we have a very suggestive record that William Roberti, Canon of the Hospital of St. Mary, is appointed Proctor-General in England for the recovery of their lands and rents. The late Proctor, John de Roncesvalles, had died, and the Prior in Navarre,[1] not being informed of the fact, did not appoint a new Proctor, " war and other impediments hindering them, so that their lands and rents were taken by divers men." Immediately following, letters of protection are given to William Roberti to aid him in his task, " in consideration of the

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[1] Andrés Ruiz de Medrano ; *ob.* August 21, 1327 (?).

benefits constantly given in that Hospital to poor pilgrims visiting the shrine of Santiago." As the result of this vigorous action the House of St. Mary Roncesvalles, at Charing passed through a period of comparative prosperity, for so late as 1335 a strong policy still seems to have been pursued. In that year there is an interesting record of the recovery of 10 acres of land known as " Roncesvalcroft," in Kensington. It was stated to have been abandoned by the brethren and was in the occupation of a certain Simon de Kensyngton. In such matters, however, the King's agents were usually very active. Simon de Kensyngton did not long remain in possession, for the watchful eyes of William Trussel and Walter de Hungerford, the King's escheators, were upon him and they claimed the land for the Crown. The legal argument in this dispute goes on to state how the land, not being held directly from the Crown, was restored to the brethren.

It was in the second quarter of the fourteenth century that the community of St. Mary of Roncesvalles in this country appears to have been most prosperous. The Convent at Charing Cross was the headquarters of the brethren in our islands. The Procurator for the Prior who managed the estates and collected the revenues had his residence there. The property they possessed in London was the most valuable, and consisted of plots of land in various parts of the suburbs, as well as at Charing Cross, but the Convent also possessed a considerable amount of property in Canterbury and at Oxford. Evidence remains that they derived revenue from property in Norwich and that they had possessions elsewhere in England, in Wales, in Ireland, and in Scotland. The income derived from these possessions was sufficient to permit of a subsidy towards the support of the Mother House in the Pyrenees.

At Charing Cross itself the Priory possessed a piece of land fronting on the river and extending back to the roadway between London and Westminster. The depth of this plot was then not so great as it is now, for the waters of the river extended much nearer to Charing Cross than at present.[1] The position of Inigo Jones's well-known watergate at the foot of Buckingham Street, the last relic remaining of York House, indicates the line of the river bank at a date over two hundred years subsequent to the time now under consideration.

Occupying the most easterly part of the river frontage was situated

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[1] Charing Cross stood approximately on the site now occupied by the statue of King Charles I.

the Church of the Convent. This Church, or Chapel as it was usually called in London, was built soon after the foundation of the Convent, but there is evidence that considerable alterations and additions were made much later, perhaps at the end of the fourteenth, and again during the last phase of the existence of the house, in the fifteenth and sixteenth centuries. Some idea of the appearance of the Chapel and the neighbouring buildings may be gained by studying two ancient drawings still in existence made while the conventual buildings were standing.
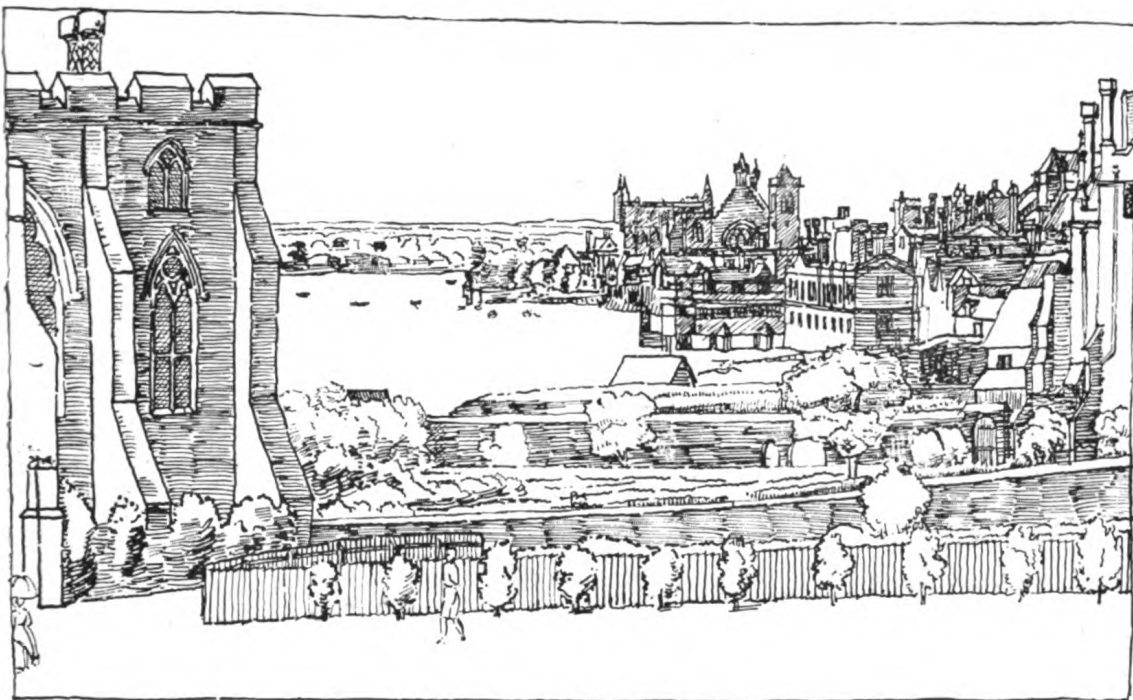
FIG. 8.

After an ancient drawing in the Gardner collection. On the left is part of the south end of the chapel of St. Mary Roncevall; in the foreground and to the right the gardens of the Convent. In the distance the river and the buildings of Whitehall and Westminster.

One of these is the well-known sketch of London by Anthony Van den Wyngaerde, dating from the middle of the sixteenth century. The other is a very beautiful sketch in the Gardner collection which shows a portion of the south-western end of the chapel, the gardens of the Convent, and in the distance Whitehall and Westminster. Judging by the evidence thus obtained, the chapel consisted of a rectangular nave,

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built of stone. The type of work indicates that it was built about the middle of the thirteenth century. There appear to have been two storeys in this building, the lower storey with three large pointed windows, and the upper storey with three smaller windows also pointed. The upper part, with the small windows, may have formed the clerestory. It is possible, however, that the upper part of the church was cut off from the lower part, and that this upper storey was lighted by the three smaller windows alluded to. Instances of this arrangement are known to have occurred in the churches belonging to hospitals. In such cases part of the church served the purpose of sheltering the sick, while at the eastern end was the chapel proper, arranged so that the sick should have the full benefit of the services of the church.

The pitch of the chapel roof was steep, the form most easily constructed at the period of which we speak, and was no doubt covered with lead. A belfry was situated at the north-eastern end of the chapel. Certain buildings of a much later date than the main part of the edifice, and probably built of brick, are seen to have been added to the northern and southern ends of the chapel, and along the river front. From a terrace on the south-east side of the chapel stairs led down to the water's edge. Immediately to the west of the chapel were the Convent gardens, extending in the direction of the roadway to Westminster, and partly terraced to the river bank. Lying back from the chapel were the conventual buildings and other tenements in the possession of the community. These appear to have been arranged on both sides of a court which opened on the high road close to the cross.

It is stated that over the doorway of each of these houses was sculptured a cross, according to the use of Roncesvalles. There also appears to have been a Latin inscription around or near the doorway of the chapel indicating the date of an addition or restoration in the time of Henry IV. The exact position occupied by the Hospital itself cannot be now identified unless, as is very probable, the chapel itself did duty both as a church and a hospital. The churchyard of the community was probably situated in the lands to the southwest of the conventual buildings. The situation of the chapel corresponds approximately to the middle section of Charing Cross Railway Station in alignment with York Gate and extending towards the land now occupied by Craven Street and Northumberland Avenue.

THE BLACK DEATH (1348-49).

The event which seems to have done more than any other single cause to depress the fortunes and to change the future relationships of the foreign community of St. Mary was the catastrophe of the Black Death. The plague visited London in the autumn of 1348. Its ravages were serious in the early days of November, and the condition of affairs had produced so much alarm that Parliament was prorogued on January 1, 1349. A further prorogation occurred on March 10, the reason given being that the "pestilence was continuing at Westminster, in the City of London, and at other places, more severely than before (*gravius solito*)." It had diminished, or almost disappeared, in London by the end of that year. The clergy appear to have suffered throughout the country even more severely than the rest of the
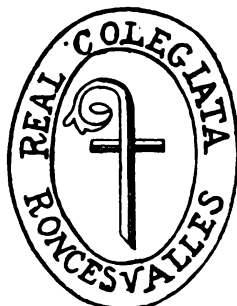
FIG. 9.

The cross according to the use of Roncesvalles, from a stamp now used in the " Real Casa." This ensign " unites in one figure the Cross, the Crozier, and the Sword."

populace—evidence that they did not fail in their duties during that terrible period. Geoffrey le Baker, a clerk of Osney, says, " Of the clergy and cleric class there died a multitude known to God only."[1]

What actually happened at Charing Cross can only be guessed, but there are very clear indications that the Convent of St. Mary Roncevall suffered severely. The deaths among the brethren were probably numerous, for no one sufficiently important seems to have survived to uphold the interests of the parent House. The depressed state of the Convent is the more striking as the calamity occurred after a period of great prosperity.

[1] Creighton, " History of Epidemics in Britain," 1891, Camb., i, chap. 3.

When the plague ceased and for some time after, the affairs of the Convent appear to have been in complete confusion. The immense mortality during the year of the prevalence of the plague disordered to a serious extent the whole executive of the country, and especially affected the Church. In some cases the community in the smaller convents died out entirely, in others the senior members and officials completely disappeared from the records, and in all cases serious losses must have occurred. This fatality was not confined to the monastic clergy alone ; those holding benefices outside the religious houses perished probably in greater numbers. The consequence was that throughout the country rapid institutions to vacant benefices had to be made to carry on the duties of those who had fallen, and frequently unlettered, and in some cases unworthy, clerks succeeded to important charges. These difficulties must have been much accentuated in the case of alien houses. They suffered, as did all the other religious communities, and in addition, they felt the difficulty of being remote from the parent House. Officials who would have had the interests of the House at heart could not be sent from abroad to take charge on short notice, and the Prior at Roncesvalles, no doubt, did not even know of the deaths of his subordinates at Charing Cross. The vacant benefices in the possession of the alien houses were sought for and obtained by clergy on the spot who had influence, and there can be no doubt that the conclusion is correct, that many of these persons were more concerned in advancing their own interests and in retaining the possessions thus secured, than in guarding the rights of the foreign abbey or priory. Not only, however, did the local clergy secure the vacant benefices and property, but in many cases the property of the alien houses was taken possession of by their influential neighbours, sometimes without opposition, when the original possessors had entirely disappeared, at other times by the high hand when the rightful owners were few or feeble.

THE CONFLICT OF INTEREST BETWEEN ALIEN AND ENGLISH CLERGY AT SAINT MARY RONCEVALL (1350-1414).

In spite of these adverse conditions the house of St. Mary Roncevall survived, although new influences appear directing its affairs. The earliest records after the Plague show that English clergy were in possession of the Church and Hospital, and the title of Warden is made use of for the first time by the chief clerical official. Special interest

appears to have been taken in its affairs by the Crown, perhaps because its estate afforded a ready source of revenue, but more likely on account of the proximity of the Convent to the Royal Palace at Westminster. The Church and Hospital afforded convenient opportunities of preferment and of income to the clergy connected with the Chapel Royal of St. Stephen or of the Royal Household.

The first records after the Plague are of special significance. In 1379, in the reign of Richard II, the chapel and lands of St. Mary Roncevall were seized into the King's hands in accordance with the statute dated at Gloucester, "for the forfeiture of the lands of schismatic aliens," and in accordance with the policy of the Crown at this period to suppress all the alien religious houses. At this time there was a certain Nicholas Slake, a clerk, who, wise in his generation, had not failed in procuring preferment and much advantage from the Church. He possessed various benefices throughout the country, and finally became Dean of the Chapel Royal of St. Stephen, Westminster, in the year 1396.[1] Nicholas Slake had obtained possession of the revenues and had become Warden of the Hospital and Chapel of "Rounsyvale," probably when the Crown took possession of the property after the forfeiture of 1379. In 1383, we find that the King grants a writ of aid for Ralph Archer, Proctor of Nicholas Slake, Master of the Hospital of St. Mary Roncevall, "to arrest and bring before the King and Council all persons whom he shall prove to have collected alms in the realm as Proctor of the Hospital, and converted the same to their own use."

It seems probable that an effort had been made by Nicholas Slake to put the affairs of his church in order, either on his own initiative, or on account of the renewed interest taken in the house at Charing Cross by the Mother Convent. It is noteworthy that about this time the Prior and brethren at Roncesvalles commenced a process at law to claim their property. An inquisition took place before the King's Court at Westminster into the foundation of the Hospital, and as it appeared in evidence that the chapel and its property belonged to the Prior of Roncesvalles, it was restored (April 23, 1383).

There now appears to have been a short period of quiet and good fortune for the brotherhood. It will be remembered that the years 1390-92 are known as the three " quiet " years of the Hundred Years' War with France. Peaceful communications were restored between

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[1] Hennessy, " Novum Repertorium Ecclesiasticum Parochiale Londinense."

Navarre, through France to England, so that we are not surprised to find that in 1389, Garcias, a Canon of Roncesvalles, is ratified as Warden of the Chapel of Roncevall by Charing Cross, at the supplication of the King's kinsman, Charles of Navarre. What happened in the next year, 1390, is a little obscure. Garcias does not seem to have been at home or comfortable at Charing Cross, or the influence of the London clergy may have prevailed over the alien, for in that year we note that John Hadham, the King's clerk, is Warden of the Hospital.

The following years must have brought much anxiety to the remnants of the alien clergy in England. They must have become more and more conscious of the insecurity of their tenure. England was once more engaged in deadly war with France ; communications between the two countries were constantly interrupted or carried on with great risk and danger, and in the case of the Hospital of St. Mary, the sending of their surplus revenue to Navarre through France must have been regarded by the King, constantly seeking funds for military purposes, with the utmost jealousy. Most of the alien houses had already been suppressed. The continued existence of the House of St. Mary Roncevall, as mentioned above, had been seriously threatened. The affairs, therefore, of the community of Charing Cross must have been in great disorder and can have afforded little satisfaction to the parent House. That the Prior did make efforts to supervise the affairs of the Convent in England is clear, but the control must have been very ineffective.

In 1396, John Newerk obtained the wardenship and the property of the Hospital, including the charters, various apostolic bulls and other documents, and apparently installed himself comfortably in his benefice, for in the year 1399 we find that ratification of the estate of Ronceval was given to Newerk. In the meantime Francis, who was then Prior at Roncesvalles, learned of the doings of John Newerk, and commenced a process against him for having broken into the close and houses belonging to the Prior in the parish of St. Martin's in the Fields, of having removed a sealed chest worth 20*s*., containing the charters and other muniments of the hospital, and claimed damages to the extent of 200*l*. This action seems to have dragged on for a wearisome length of time, for in the year 1409 special directions are given by the King, that, " whereas the suit has been long delayed, the justices are ordered to proceed therein, but not to give judgment without consulting him." The plea was concluded in Hilary Term, 1409, and judgment was given to the effect that at the time of the trespass the close and houses

were the sole and free tenement of the Prior, so that John Newerk was mulcted in damages to the extent of 100 marks, but he was held not guilty in respect of the matter of the chest and writings. Though the Prior was largely successful in this action, his success did not long delay the only possible issue.

Saint Mary Roncevall passes into the Hands of English Clergy (1414).

The end of the strife between the Navarrese and English clergy for supremacy in the House at Charing Cross was not far off. By the year 1414 the few remaining alien priories and convents were suppressed by Henry V, but what influence this final suppression had on the activities of the Convent of St. Mary Roncevall is not quite clear. English clergy were already in possession of the appointments in the Church and Hospital, and the services of the Convent to the people of London seem to have continued. There arose no question of handing over the property for secular purposes, and probably there was no serious dislocation of the usual work of the House. The management of its affairs must simply have been recognized to be entirely independent of the Prior and his officials. It is to the credit of both parties that this separation was accomplished without severe disturbance, for, as we shall see, communications between the Prior at Roncesvalles and the Warden of St. Mary Roncevall remained on what seems to have been a friendly basis. The English wardens who were now appointed were, so far as is known, men of note, and frequently in close relationship with the Court.

In 1417 Walter Sheryngton, Prebendary of Goderynghill, is confirmed in his possession of the estate and the " free chapel " of Rouncevall in the Diocese of London. During his tenure of office there appears to have been an action at law between the Prior of the Hospital and the Warden, the exact nature of which is uncertain; but during its course the conditions of the early foundation of the Convent at Charing Cross came under discussion.

In 1432 Roger Westwode, who was also a Prebendary of the Chapel Royal, St. Stephen's, was Warden of the Chapel or Hospital of St. Mary Roncevall. He was clearly conscious of the advantages to be gained by the connexion with the House in the Pyrenees, as he obtained a royal licence to receive bulls and letters of indulgence for the profit of his own chapel from the Prior in Navarre, and also to

remit alms for the poor and other monies to the Priory.   An echo of the old difficulties can be noted in this document, as the royal licence states clearly that the said Priory is "outside our allegiance, and the licence is to continue so long as there is no war between us and the King of Navarre."

The fortunes of the Hospital in the middle fifteenth century can only be judged by inference, but there can be little doubt that it continued to be useful, and that gradually its functions as a place for the cure of the needy sick became more developed.   The co-operation of nursing sisters must have also become familiar to the London community by this time.   The brethren and sisters had pursued their avocation in tending and in nursing the infirm from very early days in the history of the community of St. Mary both in Navarre and in England.   As the religious house became more distinctly a hospital their services must have been in constantly increasing request.

The Establishment of the Fraternity of St. Mary Roncevall (1475).

The year 1475 marks the official commencement of the last stage of the existence of the Hospital.   In that year a royal charter of Edward IV records the "foundation of a fraternity or perpetual gild of a master, two wardens and the brethren and sisters who may wish to be of the same in the Chapel of St. Mary Rounsidevall by Charyng Crosse, and of a perpetual chantry of one chaplain to celebrate divine service at the High Altar in the said chapel."   In 1478 a grant in mortmain is recorded to the Master, Wardens, Brethren and Sisters of the Fraternity of the said Chapel or Hospital, and of its property, revenues and privileges, for the sustenance of the chaplain and two additional clergy who now seem to have been required for the services of the chapel, and of "the poor people flocking to the Hospital."

In the years following, the affairs of the Hospital seem to have been administered with energy and prudence, for we have records in 1494, 1495 and 1496 of legal proceedings concerning the property and privileges of the Hospital, in which the master and wardens vigorously upheld their position and successfully defended their rights.   The litigation, which seems to have gone on intermittently chiefly for the recovery of the ancient possessions of the Hospital, appears to have been

brought to a conclusion in the year 1510, when, in the Mastership of Laurence Long, the fraternity paid the sum of 20*s.* into the hanaper for the confirmation of the various charters granted to the fraternity by the King.

Again there seems to have been a period of comparative calm and, no doubt, of successful performance of the duties of the Hospital. The fraternity may have even thought that the storm which burst over the Church in the time of Henry VIII would leave them unharmed on account of the fulfilment of their useful functions in the community, for so late as the year 1542, while William Jenyns was Master, a record can be read giving evidence of their continuing interest and careful management of their affairs. In this year they obtained certain property and a wharf in the parish of St. Margaret, in respect of rents to be paid from a tenement called the " Shippe " and certain lands in the Parish of St. Clement Danes without Temple Bar. This, however, is the last deed recorded of the ancient community, with the exception of the final act which was very soon to take place.

DISSOLUTION OF THE FRATERNITY BY HENRY VIII (1544).

The policy of the King, enforced in many cases by the greed of his agents and other members of the Court, could not leave the Hospital unscathed, and not even the charitable deeds of the fraternity were sufficient to save them from dispersion. The grief with which the master, wardens and members of the fraternity assembled to ratify their last official act in a corporate capacity may be conceived, and it is possible to some faint extent to imagine the feelings of despair and of bitter irony uppermost in the minds of the brethren and sisters when they heard the words of the Deed of Surrender read aloud. In this document the master, wardens, brethren and sisters of the fraternity declared that they are '" specially influenced at the present time by divers causes and considerations to give and concede by this Charter to the most excellent and invincible prince, our Lord Henry VIII, by the Grace of God, King of England, France and Ireland, Defender of the Faith and Supreme Head of the Church in England and Ireland," their Church, Hospital, and all other property and privileges. The affixing of their Common Seal to this document concludes the chequered history of the Convent of St. Mary Roncevall at Charing Cross (November 11, 1544).

<center>FIG. 10.   FIG. 11.</center>

Fig. 10.—The common seal of the Fraternity of St. Mary Roncevall.
Fig. 11.—From the imperfect impression attached to the Deed of Surrender.

Though the remaining members of the Community were deprived of their offices and ejected from the home which they had so long possessed at Charing Cross, their lot was not so hard as in the case of many others driven into the world at this time. A pittance from their income was left. There may be read in a book of payments of Edward VI, under the heading " Pencions out of Monasteries" that the guardians of Roncevall were allotted the munificent annual income of 6*l.* 13*s.* 4*d.* Very oddly in this document the larger sum of 8*l.* is entered and crossed out in favour of the smaller amount mentioned. The amount of the pension was measured with parsimonious exactness. Quarterly payments of 33 shillings and 4 pence are entered as being paid to the few surviving members of the fraternity so late as at Christmas, the Annunciation, Midsummer and Michaelmas, 1551 and 1552.

<center>THE LATER HISTORY OF THE ESTATE OF RONCEVALL.</center>

The subsequent fate of the Chapel and Hospital and the land on which they stood may be shortly stated. The site was granted, no doubt with the buildings on it, in the year 1550 to Sir Thomas

Cawarden.[1] Cawarden had been master of the revels to Henry VIII and had established claims to reward or remuneration from the King which had not been satisfied on his death. He was able to establish and enforce these claims in the early years of Edward VI. With some difficulty he obtained in discharge of his claims on the Crown the estate and property of Roncevall and also the church and property of the Blackfriars within the City of London. He seems also to have secured at this time the stewardship of Nonsuch Palace and its lands in the County of Surrey.

The properties of Roncevall and of the Blackfriars soon passed from the hands of Cawarden, probably during the period of wild speculation in land and real estate which followed the dissolution of the religious houses, but the stewardship of Nonsuch he continued to hold with much tenacity in spite of the efforts to dislodge him from this favourite position by Cardinal Pole during the reign of Queen Mary.

Cawarden died in the year 1559. In the meantime the Roncevall property had passed to Sir Robert Brett. It was purchased early in the seventeenth century by Henry Howard, Earl of Northampton, who built himself a town house, described as a " sumptuous palace," on the site, using for the purpose the material of the ancient Convent. This house was completed in the year 1605 and was known for some years as Northampton House. It consisted of buildings arranged on three sides of a quadrangle, and open towards the garden and river. From him the property passed by inheritance to his nephew, Thomas Howard, first Earl of Suffolk, the second son of Thomas, fourth Duke of Norfolk, who completed the quadrangle, the house being then known as Suffolk House. From the Howard family the property passed by an heiress to Algernon Percy, Earl of Northumberland, in 1642 ; another heiress of the Percy family brought the property to Charles Seymour, Duke of Somerset. While in the possession of the Somerset family and their immediate successors, the Strand front was much improved and acquired the architectural features so long associated with Northumberland House at Charing Cross. By another heiress, Lady Elizabeth Seymour, the property passed into the possession of the present Duke of Northumberland's family.

In consequence of the construction of the Thames Embankment, and the necessity for making a wide approach from Charing Cross, the late Metropolitan Board of Works bought the property from the Duke

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[1] " A Survey of London," by John Stow, 1603. The edition by Charles L. Kingsford, Clarendon Press, 1908, i, p. 341 ; ii, p. 350.

of Northumberland, in 1874, for the sum of £500,000. Northumberland House, the last of the old river-side mansions, was completely demolished and now Northumberland Avenue and the great buildings near it occupy the site of the Convent and Hospital of St. Mary Roncevall.[1]

THE RONCEVALL PROPERTY IN LONDON ; FROM INFORMATION IN AN
    UNPUBLISHED MANUSCRIPT OF THE BEGINNING OF THE SEVEN-
    TEENTH CENTURY IN THE LIBRARY AT RONCESVALLES.[2]

Most of the ancient documents dealing with the history of the Priory have been destroyed or lost as the result of war, fires and other causes. There remains in the Library at Roncesvalles an unpublished MS. dealing with the early history of the Priory and its dependencies, written about the second quarter of the seventeenth century by Don Juan Huarte. This MS. incorporates information obtained by the writer from various sources, and especially under the date April 12, 1623, from a certain Brother Miguel de Spiritu Sancto, who derived it in his turn from a certain Don Francisco Olastro—(Francis Oliver ?)—who is stated to have been an ambassador from England in Madrid. This document states that there is situated in the suburbs of London a wide street named " the Street of Our Lady of Roncesvalles." The houses in this street have sculptured over their doorways a single cross according to the use of Roncesvalles. At the end of the street is a large building, now nearly dismantled, which was a sumptuous church in the time of the Catholic Religion. Over the portico of the church were sculptured three crosses of the same form, and in addition there was a clearly engraved Latin inscription to the effect that this church was built and completely finished in honour of the Blessed Virgin by Henry IV, King of England, who, in addition, granted to the Community of St. Mary of Roncevall large possessions and revenues for the service of the Priory and Hospital. The inscription is dated in the MS. 1378, but this date, which is clearly impossible, is probably an error of transcription for 1408, arising from peculiarities in the formation of the figures, and there are other errors to be noted, showing that the information is derived through indirect channels. The inscription is given as follows :—

" Henricus quartus Dei gratia Rex Angliæ, Iberniæ et Irlandæ, Princeps
Gales, et Dux Lancastrie ? Hanc ecclesiam sacratissimæ Virginis et Matris
Mariæ construxit locupletavit et a fundamentis edificavit, et eam in
honorem dictæ Sanctissimæ Virginis et Matris multis possessionibus et
redditibus et inquiliniis ditavit, et eam cum suis omnibus possessionibus,

[1] " Old and New London," V. iii, by Edward Walford (Cassell, Petter and Galpin). " Charing Cross," by J. H. MacMichael (Chatto and Windus), 1905.

[2] The author is indebted to Don José Urrutia, the Abbot-Prior, for a précis of this document.

inquiliniis subditis et redditibus donavit in donum perpetuum ordini et hospitali generali coenobii Sanctæ Mariæ Roncesvallis in anno domini Salvatoris nostri Jhesu Christi, MCCCLXXVIII."

The document goes on to say that the Priory possessed in England property including the Chapel and Convent at Charing Cross (" Caringrasso ") of the yearly value of 9,300 pounds English money, corresponding to 8,223 Spanish ducats, and that it also owned property in Canterbury (" Conturbel ") of the yearly value of 4,000 pounds, and in Oxford (" Oxonia ") of 5,700 pounds. A Procurator was appointed directly by the Abbot at Roncesvalles who had his headquarters in London at Charing Cross, and had complete powers of administration to deal with the property of the Convent scattered through England, Scotland, and Ireland, and he also directed the Hospital and other enterprises of the Brotherhood.

The Huarte MS. also states that, in the ancient archives of the Abbey there existed a record in alphabetical arrangement, from which it is gathered that Henry VI of England, finding that no official was being sent from Ronces-valles, directed one of his chaplains to obtain from Roncesvalles an account of the property in London and Charing Cross belonging to the Priory : " Las per-tenecientes á la capilla y encomienda de Roncesvalles situada junto á Carin-grasso de Inglaterra," " and a warrant to collect the income and charitable contributions and send them to Roncesvalles for the maintenance of the clergy and the poor. There is also a statement on the authority of a " military personage in the City of London," that there existed in London a large house which had belonged to Roncesvalles, as shown by the crosses of the special form used by the Order still to be seen on the stones, and that this house had been converted into a seminary of the Anglican Church.

It will be observed that much of the information in the Huarte MS. is traditional and cannot be accepted without careful collation with the more complete and authentic information contained in the English records. It is, however, of much interest to know that a document perpetuating the memory of the Hospital of Roncevall in London still exists in the parent House.

THE ILLUSTRATIONS.

FIG. 1.—The Chapel of St. Mary Roncevall on the bank of the Thames previous to 1544. The chapel is of the middle of the thirteenth century, in two storeys, with later additions, probably of the Tudor period, to the south of the church and at the north-east angle. The tower and belfry are at the north-east end of the church. The chapel is built on a terrace, faced by a high wall, pierced by a door giving access by steps to the river. The sketch gives indica-tions of portions of the conventual buildings, some of which may be identified by referring to the inventory contained in the grant to Sir Thomas Cawarden ; for instance, the gardens, the churchyard, wharf, the almshouse. The Cross at Charing, St Martin's Church of that period, other features in the village of Charing, and St. Giles's in the Fields, may be identified.

Fig. 2.—A chart of the Western Pyrenees, showing the roads through the passes, and the position of Roncesvalles and Ibañeta.

Figs. 3 and 4.—The effigy of William Marshall, Earl of Pembroke (*ob.* 1219), in the Temple Church.

Figs. 5, 6, and 7.—The effigy of William Marshall, Earl of Pembroke, son of the preceding (*ob.* 1231). These figures of the Marshalls are from Edward Richardson's "Monumental Effigies of the Temple Church." Longmans, 1843. William Marshall, sen., the regent, and his son were closely associated with the Knights Templars, and benefactors of the Order. It will be noted that the effigy of the father shows the figure in a straight position, whereas the effigy of the son is in the cross-legged attitude. The question is naturally raised as to the significance of the cross-legged position. There is no doubt that William Marshall the elder did go to the Holy Land in fulfilment of the dying request of Henry, the eldest son of Henry II, in the years 1185-87. In the case of the son there is no evidence of a journey to Palestine, though it is possible that he may have taken part in campaigns against the Moors in Spain.

Fig. 8.—A copy of an ancient drawing lately in the possession of Mr. E. Gardner, now in the collection of Sir Edward F. Coates, Bart. The drawing is supposed to be contemporary and to have been the work of an early Italian artist resident in England. It was purchased at the Strawberry Hill sale by Dr. Wellesley for the Gardner collection ; and the Marquis of Salisbury is stated to have several drawings by the same early Italian artist. The sketch shows part of the north-westerly aspect of the Chapel of St. Mary Roncevall, with some of the later Tudor additions. The battlements were probably added when additions were built, perhaps in the time of Henry IV, or later. The Tudor chimneys appearing over the battlements are reminiscent of the work of Cardinal Wolsey at Hampton Court and would have been constructed in brick. The building on the extreme left of the sketch is probably the corner of a north porch. The sketch also shows the gardens of the Convent of which very special note is made in Cawarden's inventory, and in the distance the buildings of Whitehall and of Westminster.

Fig. 9.—Copy of an official stamp now used in the Priory, showing the Cross of Roncesvalles.

Figs. 10 and 11.—The common seal of the Fraternity and Guild of St. Mary Roncevall. The seal appears to be of the fifteenth century and was no doubt the seal specially mentioned as being given to the Fraternity by Edward IV. The seal is round, the engraved part being 2¼ in. in diameter. Unfortunately the impression is imperfect.

Fig. 10 is from a cast taken by Doubleday in the middle of the last century.

Fig. 11 is from a cast taken by Mr. Ready from the impression still attached to the Deed of Surrender. It will be noted on careful examination that there are certain interesting differences in the state of preservation of these two casts. The seal on the Deed of Surrender has been backed and strengthened, but this repair does not altogether account for the differences

noticed in the impressions. It is possible that another impression may have existed when Doubleday made his cast. The seal represents "the assumption of the Virgin, who is standing on a crescent upheld by an angel and surrounded by radiance. At each side three flying angels issuing from clouds. Overhead in clouds the Trinity. The legend reads :—

'SIGILLU(M COE FRATER)NITATIS BE MARIE DE ROUNCIVA(LL).' "

<div align="right">. (Birch's Catalogue of Seals.)</div>

The author cannot conclude this account of the Convent and Hospital without expressing his cordial thanks to those from whom he has sought assistance and criticisms. He desires especially to acknowledge his obligations to Mr. E. Salisbury and other officials of the Public Record Office for their courteous and patient guidance ; to Mr. E. Gardner for his kind permission to see the valuable collection of material illustrating the history of London formerly in his possession, and to reproduce one of the drawings in this paper ; to Mr. Herbert Wigglesworth and his assistant, Mr. L. H. Glencross, for drawings of the Chapel of St. Mary, and for important criticisms respecting its structure and architectural features ; and to Don José Urrutia, the Abbot Prior, and Don Ignacio Ibarbia Fernandez de Guevara, Canon of Roncesvalles, for much information respecting the present state of the Convent, and for their sympathetic interest in the history of one of the ancient "cells" of the Real Colegiata.

<div align="center">CALENDAR OF THE HOSPITAL OF ST. MARY RONCEVALL, CHARING CROSS.</div>

ANNO

1229. Letters of Protection to the Brethren of St. Mary Roncesvalles.

De Protectione. Fratres hospitalis Sancti Marie Roscidi Vallis habent literas de protectione sine termino cum hac clausula :—

"Rogamus vos quatinus cum nuncii ejusdem hospitalis ad vos venerint elemosinas petituri," &c.

<div align="right">Calendar Patent Rolls, 13 Henry III, p. 265.</div>

1232. Record of the grant to St. Mary and the Hospital of Roncevaux (Roscida Vallis) of the gift which William Marshall, sometime Earl of Pembroke, made to them of all his houses at Cherring, and the houses and curtilages adjoining them, formerly belonging to William Briwere, and of 100s. at Suthanton, payable from the houses of the said Earl there, of 13l. of land in the Moor of Magor and of a carucate of land in Assendon which he bought from Robert de Rochford. 11th August ; Wenlock.

<div align="right">Calend. Charter Rolls, 16 Henry III, p. 168.</div>

ANNO

1240. Grant by the King to the Brethren of " Roscida Valle " of 32 acres which they have sown in Pevensey, of land which William Marshall, Earl of Pembroke, gave to them. 26th July ; Quicfeld.

Calend. Close Rolls, 24 Henry III, m. 8.

1242. Grant of pasturage by King Henry III beyond the water called " Lador " (Adour) to the Prior and Brethren of the Hospital of St. Mary Roncevaux. La Sauve Majeure.

Calend. Pat. Rolls, 26-27 Henry III, p. 334.

1242. Bond by the King for payment of 90 pounds of Morlaas to Dominic Paschalis, Provost of Roncevaux. La Sauve Majeure.

Calend. Pat. Rolls, 27 Henry III, p. 349.

1253. Simple protection, without term, for the prior and brethren of the Hospital of St. Mary, Rouncevall. 14th February ; Windsor.

Calend. Pat. Rolls, 37 Henry III, m. 17.

1253. Protection for one year for the Master and brethren of Roscidevalle, with this clause, that all their beasts may feed throughout the King's land of Gascony, as they have been accustomed to do. 1st October : Benauge.

Calend. Pat. Rolls, 37-38 Henry III, m. 20.

1254. Protection for four years, as above. 26th August ; Bordeaux.

Calend. Pat. Rolls, 37-38 Henry III, m. 8.

1278. Henry, son of William of Smalebrok, nominated Attorney for 2 years for the Prior of the Hospital of Roncevaux. Westminster.

Calend. Pat. Rolls, 6 Ed. I, p. 283.

1279. The sum of 16*l.* 13*s.* 4*d.* charged on the pedage of " Maramande " (Myramand), to be paid to the hospital of Roncevaux (Rossidevall). Westminster.

Calend. Pat. Rolls, 7 Ed. I, p. 7.

1280. Henry, son of William of Smalebrok, nominated Attorney for 2 years for the Prior of the Hospital of Roncedevall. Westminster.

Calend. Pat. Rolls, 8 Ed. I, p. 382.

1281. Note in a Record of Accounts that the King's lands granted to Eleanor his mother, of the town of Myramand, are charged with 20*l.* Arvaldenses equivalent to 16*l.* 13*s.* 4*d.* of Tours to the hospital of Rossedevall. Westminster.

Calend. Pat. Rolls, 9 Ed. I, p. 447.

ANNO

1283. Protection for Brother Lupus, Priest, Envoy, and Preceptor of the Houses in England and Ireland of the Prior and Convent of the Hospital of St. Mary Roncevaux, coming from the Pope with indulgences for the remission of sins. Macclesfield.

Calend. Pat. Rolls, 11 Ed. I, p. 75.

1290. G. Prior and the Hospital of Roncevaux (Roscida Vallis) to Edward I, praying the King to be attentive to what shall be told him by certain Brethren of the Hospital who are bearing the present letter to England and to grant their request. 2 Id. July.

Ancient Correspondence, vol. xx, No. 44.

1291. *Emendæ.* Item, fratre Lupo procuratori Hospitali Runcivallis dampnis fratrum dicti Hospitalis adjudicatis coram auditoribus querelarum pro domibus suis Suthamtonæ   xiiij *li*, ij *s.*

> 19 Ed. I. Extract. Liberationes factæ per Executores Dominæ Alienoræ Consortis Edwardi Regis Angliæ Primi : Rot. primus. (*Vide* Manners and Household expenses of England: p. 105, Roxburghe Club; edited by T. Hudson Turner, presented by Beriah Botfield: 1841 (London, William Nicol, Shakespeare Press).

1292. William de Cestre, and Peter Arnaldi de Sancto Michaele nominated attorneys for 5 years for the Prior of Roncyvall staying beyond seas. Westminster.

Calend. Pat. Rolls, 20 Ed. I, p. 476.

1293. Lupus de Canone, preceptor of the Houses of Ronceval in Bordeaux and Arnaldus de Sancto Johanne, a lay person, nominated attorneys for the Prior of Ronceval (Roscidevall), staying beyond seas for three years. 12th May; Westminster.

Calend. Pat. Rolls, 21 Ed. I, p. 14.

1293-94. The Prior of the Hospital of Rosci de Vall seeks against Adam, son of Walter the Scot, one toft with appurtenances as the right of the said Hospital, by writ of entry. A predecessor of the Prior is admitted to have held this toft and tenements 15 years previously (in 1279).

Assize Rolls, No. 544, 22 Ed. I, m. 21.

Probably late Ed. I, or Ed. II.   A petition from the Prior of the Convent and Hospital of Roncevall to restore to them property consisting of a site before the Cross at Charing, and also certain other small rents and three acres of land which John of Lincoln, Burgess of London, had held

JU—9

for a period of ten years, and which on his death, on account of the default of the Attorney of the said Prior and Convent and Hospital, were taken into the hand of the King. The petition requests the restoration of this property to the Prior and Convent to hold them as they had been in the custom of doing " come les gentz dil pais le sauont bien et toute la veisinetee." Undated.

Ancient Petitions, 9635.

1310.   Evidence of property held in Norwich by the House of Roncevaux, in a licence for alienation in mortmain by William But of Norwich, to the Friars Preachers of that place.   30th March ; Westminster.

Calend. Pat. Rolls, 3 Ed. II, p. 222.

1321.   William Roberti, Canon of the Hospital of St. Mary Roncevall, appointed Proctor in England for the recovery of their lands and rents.   Their late Proctor, John de Rouncevall, having died, and not being aware of his death, they did not appoint a new Proctor, wars and other impediments hindering them, so that their lands and rents were taken by divers men.   24th August ; Westminster.

Calend. Pat. Rolls, 15 Ed. II, p. 23.

1321.   Protection granted to the messengers sent to England by William Roberti, Canon of the Hospital of St. Mary Roncevall, and Proctor-General in England of the Prior and Convent of that place, in consideration of the benefits constantly given in that hospital to poor pilgrims visiting the shrine of Santiago.   25th August ; Westminster.

Calend. Pat. Rolls, 15 Ed. II, p. 15.

F. (?) Prior and the Hospital of Roncevaux to Edward II, on behalf of the citizens of Bayonne, greatly impoverished by the late wars.

Ancient Correspondence, xxxiv, No. 167.

1335.   An account of the abandonment of the 10 acres of land known as " Ronsevalcroft," in Kensyngton, by the brethren of the Hospital of Roncevaux ; how the land was taken by Simon de Kensyngton without the King's licence, escheated to the Crown, and finally restored to the Convent.   12th July ; Carlisle.

Calend. Close Rolls, 9 Ed. III, p. 423.

1348-49.   THE BLACK DEATH.

1379.   The chapel and lands of St. Mary Rounceval seized into the King's hands in accordance with a statute, dated at Gloucester, for the forfeiture of the lands of schismatic aliens.   2 Ric. II.

Cf. Close Rolls, 10 Henry IV, m. 7.   1409, *vide infra*.

ANNO

1382. Nicholas Slake,[1] Master of the Hospital of St. Mary Roncevalles.

The King grants a writ of aid for Ralph Archer, Proctor of Nicholas Slake, to arrest and bring before the King and Council all persons whom he shall prove to have collected alms in the realm as proctor of the Hospital, and converted the same to their own use. 18th July. Westminster.

Calend. Pat. Rolls, 6 Ric. II, p. 195.

1383. Inquisition into the foundation of the Hospital of Rouncevall, before the King's Court at Westminster.

Plac. coram Rege apud West. de term. Mich. 7 Ric. II, Rot. 21 Middx.; also Chancery Miscellanea, $\frac{68}{186}$.

It appears that the Crown had resumed possession of the Hospital and land and all its possessions after the forfeiture of 1379, and that a cleric, Nicholas Slake, had obtained the Wardenship of the Hospital and Chapel of " Rounsyvale." On inquisition, however, it was shown that the Hospital and Chapel and its property pertained to the Prior of the Hospital of the Blessed Mary of Rounsyvall, and was accordingly restored. 23rd April.

Cf. Dugdale, Monasticon Anglicanum, edit. 1820, vi, pt. 2, p. 677.

1389. Garcias, Canon of Roncivale, ratified as Warden of the Chapel of Roncivall by Charyncroix, at the supplication of the King's kinsman, Charles of Navarre. 16th November; Westminster.

Calend. Pat. Rolls, 13 Ric. II, p. 152.

1390. John Hadham, the King's clerk, Warden of the Hospital of St. Mary of Ronsyvale at Charryng by Westminster. 18th February; Westminster.

Calend. Pat. Rolls, 13 Ric. II, p. 205.

1396. Grant for life to John Newerk of the Wardenship of the Hospital of St. Mary Rouncyvall by Charryng Crouch. 20th October; Westminster.

Calend. Pat. Rolls, 20 Ric. II, p. 30, pt. 1, m. 15.

1396. Grant to John Newerk of the Hospital of St. Mary Rouncyvall. 5th October; Calais.

Calend. Pat. Rolls, 20 Ric. II, p. 44, pt. 1, m. 6.

[1] Hennessy: " Nov. Repert. Ecclesiast. Paroch. Londin." Nicholas Slake, Prebendary of Wenlakesbarn; of Erdington in Briggenorth; of Shirecote in Tamworth; Rector of St. Mary Abchurch; and Dean of St. Stephen's Chapel Royal, Westminster (1396).

ANNO

1399.   Ratification of the estate of John Newerk, Warden of the Hospital of St. Mary Rouncyvale by Charing Crouch.   28th October ; Westminster.

> Calend. Pat. Rolls, 1 Henry IV, p. 25, pt. 1, m. 16.

1409.   Exemplification at the request of John Newerk, of :—

(1) Letters patent dated 5th October, 20 Richard II (1396), granting to him the hospital of St. Mary Rouncyvall.

(2) Letters patent dated 20th October, 20 Richard II, granting to him for life the wardenship of the hospital of St. Mary Rouncyvall by Charryngcrouch.   5th February ; Westminster.

> Calend. Pat. Rolls, 10 Henry IV, pt. 1, m. 10.

1409.   Francis, Prior of the Hospital of St. Mary de Rouncyvall of the diocese of Pampeluna and Warden of St. Mary of Rouncyvall by Charyng Crosse, impleaded John Newerk, clerk, for having broken into a close and houses of the said Prior in the parish of St. Martin's in the Fields, and taken away a sealed chest worth 20s., containing charters, writings, bulls, apostolic instruments and other muniments, and committed other offences to the damage of £200 in the reign of Richard II.   John Newerk alleges that the said chapel and all its property had been seized in the King's hands according to the statute dated at Gloucester, 2 Ric. II, and that afterwards the Wardenship of the said chapel was granted to the said John by letters patent, dated 20th October, 20 Ric. II, and that he is not answerable for the above property, etc., to the said Prior without consulting the King, and whereas the suit has been long delayed the King orders the Justices to proceed therein, but not to give judgment without consulting him.   Westminster.

> Close Roll, 10 Henry IV, m. 7 (see also m. 11).

1409.   Record of the above-mentioned plea between Francis, Prior of St. Mary de Rouncyvall, and John Newerk, Clerk, returned on a writ *de causis certiorari*, dated 1st September, 5 Henry V, 1417.

Placita coram rege, Hilary Term.   10 Henry IV, 1409.

This document recites the conditions of the trespass of John Newerk on the Monday after the Feast of All Saints, 21 Ric. II, when with force and arms he broke into the close and houses of the said Prior in the town of Westminster, mentioning the sealed chest and charters and the amount of damage done to the Prior.   It continues to recite John Newerk's defence and especially that he, John Newerk, had been granted the custody of the said Chapel.

Judgment : That at the time of the trespass the close and houses were the sole and free tenement of the said Prior—damages for the said

Prior 100 marks. As to the said chest and writings the said Newerk is found " not guilty."

Chancery Miscellanea, $\frac{68}{468}$.

1411. Pardon to John Newerk, Clerk, for his outlawry in the County of Middlesex for not appearing before the King to satisfy the Prior of St. Mary Rouncivall . . . of 100 marks which the Prior recovered against him on account of a trespass in the time of Richard II, he having surrendered to the Marshalsea Prison and satisfied the Prior. 5th May; Westminster.

Calend. Pat. Rolls, 12 Henry IV, m. 12.

1417. Confirmation to Walter Shiryngton,[1] Prebendary of Goderynghill, in the Collegiate Church of Westbury, of the free chapel of Rouncevale, in the diocese of London, of his estate and possession to the said prebend and chapel. Westminster.

Pat. Roll, 5 Henry V, m. 10. (By Privy seal.)

1418. Recorda 5 Henry V., pt. 1. " Recordum et processus inter Prior Hosp. beate Mar. ibidem et Custodem Capelle ibidem ubi fit mentio de primata fundatione."
The reference of this note has not been found in the Memoranda Rolls of the reign of Henry V.

1432. Royal licence to " our chaplain," Roger Westwode,[2] Master of the Chapel or Hospital of St. Marie de Roncidevall by Charyngcroix in the diocese of London, his successors or their proctors, to receive bulls and other letters of indulgence for the profit of the said Chapel, from the Prior and Convent of Rouncidevall in Navarre, in the diocese of Pamploma, and to remit alms for the poor and other moneys to the Priory in Navarre, because the said Priory is outside our allegiance, to last so long as there is no war between us and the King of Navarre. Westminster.

Pat. Roll, 11 Henry VI, pt. 1, m. 16.

1440. Grant to John Gourney of a parcel of land, late of the King of Scotland, lying between a plot of the Archbishop of York towards the south, and the chapel of St. Mary Rouncevale towards the north (etc.). 1st April; Westminster.

Calend. Pat. Rolls, 18 Henry VI, pt. 3, m. 12.

[1] Hennessy : Loc. cit. Walter Shiryngton, Prebendary of Gevendale in York ; of Offley ; of Mora, &c. ; Chancellor of Duchy of Lancaster; *ob.* 1448. Buried in St. Paul's Cathedral.

[2] Hennessy : Loc. cit. Roger Westrode, Prebendary of St. Stephen's Royal Chapel, Westminster, 1422 ; *ob.* 1433.

ANNO

1440.   Grant of the alien Priories in England and Wales to Henry, Arch-
bishop of Canterbury, and others.

> Rymer's Fœdera.   12th September, 19 Henry VI.

1475.   Foundation of a fraternity or perpetual gild of a Master, and two
Wardens, and the Brethren and Sisters who may wish to be of
the same in the Chapel of St. Mary Rounsidevall by Charyng
Crosse in the suburbs of London : " They shall form one body,
and shall have perpetual succession and a Common Seal " ; and
of a perpetual Chantry of one Chaplain to celebrate divine service
daily at the High Altar in the said Chapel, for the good estate of
the King and his Consort Elizabeth, Queen of England, and his
firstborn son Edward, and the Brethren and Sisters of the frater-
nity, and for their souls after death.   28th October ; Westminster.

> Calend. Pat. Rolls, 15 Ed. IV, pt. 2, m. 10, p. 542.

1478.   Grant in mortmain to the Master, Wardens, Brethren and Sisters of
the fraternity or gild in the Chapel of St. Mary de Rouncidevale, by
Charing Crosse, of the said Chapel or Hospital, and of its property,
oblations, and other privileges, for the sustenance of three chaplains
celebrating divine service, and of the poor people flocking to the
Hospital; provided that they grant for life to Elizabeth Berde,
widow, 6 marks yearly for her sustenance, and a fair house for
her by the said Chapel or Hospital.   9th March ; Westminster.

> Calend. Pat. Rolls, 18 Ed. IV, pt. 2, m. 34, p. 114.

1494-95.   A suit brought against the Warden of the Chapel of St. Marie de
Rounsewal as to half an acre of land.   There follows a long
legal argument respecting the patronage of the Chapel, and
other matters.

> Year Book.   10 Henry VII, Easter Term (No. 5).

1495-96.   Argument as to whether the Hospital can plead under the name
of the Master and Wardens only, or under the full title of
Master, Wardens, Brethren and Sisters of Rounceval.

Licence to plead in the former designation appears to have been
granted in their patent of incorporation.

> Year Book.   11 Henry VII, Trinity Term (No. 12).

1509-10.   Laurence Long, Master, Robert Day and William Goodwyn, Wardens
of the Fraternity or Gild in the Chapel of Saint Mary Rounceval
juxta Charing Cross, pay 20s. into the Hanaper for the con-
firmation of various letters granted to the Fraternity by the
King and certain of his progenitors.

> L.T.R. Originalia Roll.   1 Henry VIII, Rot. 139.

ANNO

1542. Will. Jenyns,[1] Master, and John Ap Hoell and Ric. More, Wardens of the fraternity or gild of St. Mary Rouncedevall by Charing Crosse, near London, grant in exchange for three messuages and one wharf in the parish of Saint Margaret, certain rents to be paid from the messuage or tenement called the "Shippe" and a field of land called "Cuppefeld," adjoining a field called "Conninggarfeld of Lyncolnes Inne," in the parish of St. Clement Danes without Temple Barre, Midd.; which belonged to St. John's of Jerusalem. 12th April; Greenwich.

> Pat. Roll, 33 Henry VIII, pt. 6, m. 11.
> Calend. of State Papers Domestic, Henry VIII,
> vol. xvii, p. 162.

1544. The Deed of Surrender, whereby the Master, Wardens, Brethren and Sisters of the Fraternity or Gild of the Chapel of Saint Mary of Rounsidevall by Charinge-crosse, in the suburbs of London, concede to the King in perpetuity all rights and ownership in the said Chapel and Church of Saint Mary of Rounsidevall, the Belfry and Cemetery adjacent to the Chapel, likewise all messuages, houses, buildings, lands, tenements, meadows, grazing-lands, pastures, rents, reversions, services, and other hereditaments whatsoever. (11th November.)

> Deed of Surrender. No. 138, Augmentation Office.

The impression of the Common Seal of the Fraternity is attached.

1550. (Abstract.) Grant to Sir Thomas Cawarden, knight, one of the gentlemen of the Privy Chamber (in completion and performance of a grant of the same premises made to him by Henry VIII before his journey into France in the 35th year of his reign, the letters patent for which were never made and sealed), of the following premises: All that Chapel of the late Hospital of St. Mary de Rowncevall, in the parish of St. Martin's, late called the parish of St. Margaret's, with the churchyard thereto belonging containing about 1½ roods; also the messuage called the almeshouse, 80 feet north and south by 23 feet east and west; also "le wharff," a stable, and all cellars and land called "le bakeside"; one garden 108 feet by 104 feet; 2 other gardens, 150 feet by 50 feet, and 120 feet by 45 feet respectively; another garden 126 feet by 84 feet, abutting on the south on a piece of vacant ground called Scotland and on the east on the water flowing in "le barge-house" and on the west upon "le comon Sewer"; another garden 102 feet by 84 feet; a messuage; a shop called "le longe shoppe" (the above

[1] Hennessy: Loc. cit. William Jenyns was Rector of St. Mary Staining, 1583-84.

are in the respective tenures of John Rede, Richard Attsell, Hugh Haward, John Yonge, and Richard Harryson), all which premises are of the clear yearly value of £12 6s. 8d.; to have and to hold to the said Sir Thomas Cawarden, his heirs and assigns for ever, in socage as of the honour of Westminster by fealty only and not in chief; paying yearly to the Court of Augmentations for the chapel and churchyard, 12d.; for the almeshouse, 4s. 8d., and 19s. for the other premises (the rents are given separately for each). 21st January ; Westminster.

Pat. Roll, 3 Ed. VI, pt. 10.

AUGMENTATION OFFICE.   MISCELLANEOUS BOOKS.   No. 259.

Book of payments from 20th March, 4 Edward VI, to 20th March, 5 Edward VI.

1551-52.   " Pencions out of Monasteries "

f. 16 d.   ROUNDESIVALL.

Alloc'.   Gardiani ibidem per annum   vj li.   xiij s.   iiij d.[1]
                                          ex.ͬ

Paide to them the xij of Aprill for theire quarters
       pencion due at Christenmas laste paste   ...xxxiij s.   iiij d.
Paide to him the xij of Aprill for theire quarters
       pencion due at Th annunciacion last past ...xxxiij s.   iiij d.
Paide to them the xxij of Novembre for her
       quarters pencion due at Midsomer last past xxxiij s.   iiij d.
Paide to them the xxij of Novembre for her
       quarters pencion due at Mighelmas last past xxxiij s.   iiij d.

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[1] The above sum is written below *viij li,* crossed out.

Further Notes on Thomas Dover.

By J. A. Nixon, M.B.

THOMAS DOVER was known in his own day as the " Quicksilver Doctor," and in present times as the inventor of Pulvis Ipecacuanhæ Compositus, and the discoverer of Selkirk. He came of an interesting and somewhat original family, and himself displayed, throughout a long life, great independence of thought and action. It is not surprising that Dover has left many vivid impressions of his personality upon the profession he adorned and the towns and countries which he visited. His family is said to have belonged to Norfolk, at any rate we can trace it no further back. His grandfather was an attorney who settled to practise in the small Cotswold town of Barton-on-the-Heath in the county of Warwickshire. This is a queer corner of England where Warwickshire, Worcestershire, Gloucestershire, and Oxfordshire seem to jostle each other for possession of some of the beauty spots of the land.

Robert Dover's name has come down to us as a peace-loving lawyer "who never try'd but two causes, always made up the difference." He lived in the reign of James I, and being a man of hospitable and cheerful disposition, he instituted, in imitation of the Olympic Games of Greece, an annual meeting for manly sports and exercises, which became known as the Cotswold Games, on a hill near Campden that bears now the name of Dover's Hill. These games were held yearly until, in 1851, they were stopped by Act of Parliament, having degenerated into a Whitsun gathering of the lowest scum of the population living between Birmingham and Oxford. An interesting book of encomiastic poems was published in 1636 in which many poets of various attainments, amongst them Ben Jonson and Michael Drayton, made verses in honour of Robert Dover and his games. The title of the collection is "Annalia Dubrensia," and Michael Drayton's contribution stands first, headed "To my noble friend, Mr. Robert Dover, on his brave annual assemblies upon Cotswold."

Robert Dover married Sibilla, daughter of William Cole, Dean of Lincoln and President of Corpus Christi College, Oxford; he had four children, two girls and two boys, of whom the elder, Robert, died in infancy. John, his second son, was born in 1614, and is said to have been baptised at Saintsbury; he was one of Prince Rupert's captains,

and married Elizabeth Vade, of Barton, by whom he had five daughters and three sons, of whom two lived to adult life. John, the elder, entered Magdalen Hall, Oxford, and resided for four years (1661-65), but did not take a degree. He then studied the law at Grays Inn and made some slight reputation as a dramatist. Ultimately he took orders in the Church, and in 1688 became Rector of Drayton, Oxon, where he died at the age of 82 in 1725. Thomas, the younger surviving son of Captain John Dover, matriculated at Magdalen Hall, Oxford, in 1680, at the age of 16, and seems to have studied medicine there until 1686, when he migrated to Gonville and Caius College. The register of admissions shows his entry in 1686 ; "Thomas Dover, from St. Mary Hall, Oxford, where he resided six years, admitted pensioner to the scholars' table. Surety, Mr. Lightwine. Matriculated at Magdalen Hall, Dec. 1, 1680. Age 16. Son of John Dover, of Barton-on-the-Heath, Warwicks, gent. B.A., Oxford, 1684 ; M.B., Cambridge, 1687." Shortly after this time Thomas Dover became the resident pupil of Sydenham in London. He has left a description of his treatment on this occasion : "Whilst I lived with Dr. Sydenham, I had myself the Small Pox, and fell ill on the Twelfth Day. In the beginning I lost Twenty-two Ounces of Blood : He gave me a vomit ; but I find by experience, Purging much better. I went abroad, by his Direction, till I was blind, and then took to my Bed. I had no Fire allowed in my Room ; my Windows were constantly open, my Bed Clothes were order'd to be laid no higher than my Waist. He made me take Twelve Bottles of Small Beer, acidulated with Spirit of Vitriol, every Twenty-four Hours."

Presently Dover settled in Bristol and achieved honourable distinction as the first medical man who gratuitously offered his services on behalf of the poor, under the care of the guardians of that city. This was in 1696, during an epidemic of spotted fever, of which he wrote later, "About Fifty Years since, the Fever raged so much in Bristol, so that I visited from Twenty-five to thirty Patients a Day for a considerable time, besides their Poor Children taken into their Workhouse, where I engaged myself, for the Encouragement of so good and charitable an undertaking, to find them Physick, and give them Advice at my own Expense and Trouble, for the two first years. All these Poor Children in general had this Fever, yet no more than one died out of the whole Number, which was near two hundred." The hospital where Dover worked is a well-known landmark in Bristol, called St. Peter's Hospital, and now used as the offices of the guardians.

In 1708, he sailed on his famous voyage round the world, two accounts of which were published in 1712. Of these the better known is by Woodes-Rogers, Captain of the "Duke," and Commander of the expedition, while the less known, but better written, description is by Captain Edward Cooke, second in command of the "Dutchess." Callander, in his "Voyages to the Terra Australis" (London, 1768), speaks in terms of the highest praise of this expedition as one of the best organized and equipped expeditions that ever left England. The enterprise was undertaken by a group of wealthy Bristol citizens, several of whom were members of the Society of Merchant Venturers in Bristol. Three of the owners were sooner or later Mayors of Bristol, two were Sheriffs, and one (John Romsey) Town Clerk. The ships are said to have been the property of Joseph Harford, whose family is still one of the most notable in Bristol. The "Duke" and "Dutchess" were legally commissioned by his Royal Highness Prince George of Denmark, then Lord High Admiral of Great Britain, Ireland, &c., "to cruise on the coasts of *Peru*, and *Mexico*, in the *South Seas*, against Her Majesty's enemies the *French* and *Spaniards*. The expedition consisted of six ships, all armed, under the "Hastings," man-of-war, forty-two guns; the "Duke" carried thirty guns and the "Dutchess" twenty-six guns. The voyage was distinguished by three achievements: the taking of the town of Guayaquil, the capture of the lesser "Manila," treasure-ship, and the relief of Alexander Selkirk from his voluntary exile on the island of Juan Fernandez. Dr. Dover was appointed, after a dispute with Woodes-Rogers, to the nominal command of the "Manila" prize, re-named the "Batchelor," frigate. Woodes-Rogers's account of this dispute gives a most unflattering description of Dover, "that it is not for the safety of the rich Spanish prize that Captain Dover command her, because his Temper is so Violent, that capable men cannot well act under him, and himself is incapable." Cooke, however, took Dover's part, and with a majority of the officers protested that he should be appointed to the command. Ultimately he was appointed the nominal commander with two other captains to navigate the ship, with the proviso, "that the said Captain, Tho. Dover, shall not molest, hinder or contradict them in their business." In Cooke's opinion, Woodes-Rogers was no easy man to get on with, while Callander describes Dover as having the reputation of being "of rough temper and could not easily agree with people about him. But his untoward disposition had one good effect, which was this: that it hindered his making any

party to support him in his ill-humours." In spite of all differences the expedition returned safely and laden with rich booty in 1711.

Two silver candlesticks still remain in Bristol Cathedral as the thank-offering of John Ramsey, the Town Clerk, for the success of the venture. After his return Dover practised medicine in Bristol, Gloucestershire and London at various times, and made no little stir by his advocacy of the use of crude mercury in the treatment of many diseases. It is suggested that it was Dover who introduced Selkirk to Daniel Defoe, and persuaded the former to entrust his diary to the famous author of " Robinson Crusoe." Tradition relates that Defoe met Selkirk in the Star Tavern in Bristol. The evidence of such a meeting is wanting, but certainly Selkirk conceived a grievance against Defoe for stealing his story and swelling it into the great romance " Robinson Crusoe."

Mr. Colyer-Ferguson has inquired industriously into the family connexions of Dr. Dover, and has brought to light many interesting details : He married soon after leaving Cambridge, though his wife's identity is unsolved. Her Christian name was Joanna, and she was buried at Barton-on-the-Heath, April 27, 1727. Their family consisted of four daughters, of whom the first two were twins, baptized at Barton in 1688, and died young ; a third daughter, Elizabeth, married John Opie, and died without issue. The marriage settlement of this daughter is now in Mr. Colyer-Ferguson's possession, and is interesting from the fact that it bears the signature of Dr. Thomas Dover. The fourth daughter, Sibilla, married John Hunt and left many descendants, of whom Mr. Colyer-Ferguson claims to be one.

History and tradition have played strange pranks with Dover's biography, and much confusion has existed between Dr. Thomas Dover and his grandfather Robert Dover. Thomas Dover has been credited by several of the county historians of Gloucestershire with being the founder of the Cotswold games, whilst his grandfather has been stated by the same authorities to be the occupant of Thomas Dover's tomb at Stanway, in Gloucestershire. The facts are as follows : Robert Dover, the founder of the Games, was buried at Barton on July 24, 1652 ; there is an entry to this effect in the Barton register, but I can find no tablet to his memory there. The tombstone popularly supposed in Barton to be that of Thomas Dover turns out, on close inspection (it is nearly undecipherable), to be erected in memory of " William Sands, who sailed round the world with Dr. Dover." This stone stands against the outside of the chancel wall at Barton on the north side. There is

an entry in the register of Stanway, in Gloucestershire, stating that Thomas Dover, M.B., was buried there on April 20, 1742.

I have found two contemporary references to his death :—

(1) *The Oracle or Bristol Weekly Messenger*, i, Saturday, May 1, 1742, No. 5, under domestic occurrences : London, April 27, from the general Evening Post : Deaths—Dr. Thomas Dover, in Warwickshire.

(2) *London Magazine*, April, 1742, p. 206 : Dr. Thomas Dover, famous for administering quicksilver to his patients, in the 85th year of his age. The last years of Dr. Dover's life were spent at Stanway House (now the seat of Lord Elcho), with his friend Robert Tracy, to whom he dedicated his famous book "The Ancient Physician's Legacy to his Countrymen." He was buried at his own request in the vault belonging to the Tracy family. This vault is situated under the altar, but no memorials remain of the family or of Dover in the church. Yet oblivion has not wholly overtaken the conqueror of Guayaquil, the homebringer of Selkirk, and the inventor of Dover's powder.

Formulæ Medicamentorum Concinnatæ.

By MACLEOD YEARSLEY, F.R.C.S.

THE admirable remarks on Herbals lately offered to this Section have prompted me to bring to your notice a little book that I have long possessed, which is a good example of the pharmacy of some hundred and twenty years ago. Its title-page, as you see, shows it to be a volume of "*Formulæ Medicamentorum Concinnatæ*," or "Elegant Medical Prescriptions for Various Disorders," of whose elegance you shall shortly judge. They are translated from the Latin of the late Dr. Hugh Smith, and were published in 1796, that being their second edition.

Before inquiring into these formulæ it will be of interest to glance at the short sketch of the life of Dr. Hugh Smith, which precedes them. There are, alas, many men who serve humanity well, at least to the best of their ability, and then pass into oblivion. They do not exactly die "unwept, unhonoured, and unsung," but after a very few years the tears are dry, the honours forgotten, the songs mute. Dr. Hugh Smith was such an one. First a pupil to his father, "an eminent surgeon and apothecary" at Hemel Hempstead, he then took his

degrees at Edinburgh, and began practice in Essex, where, we are told, he paid special interest to the intermittent fever " so prevalent in the marshy parts of that county." In 1759 he moved to Mincing Lane and published an " Essay on the Blood, with Reflections on Venesection," and soon became the most eminent of the City Physicians, " though his fame was certainly not established till, by a bold push, he launched his *carriage*, and instead of losing £200 or £300 a year, as had hitherto been the case, notwithstanding his popularity, he found himself in possession of a practice that brought him in upwards of £500 per annum." In 1760 he began to lecture on the Theory and Practice of Physic, and after three years was asked by the pupils of St. George's Hospital to give these in the West End, which he did for several years at the Piazza Coffee-house in Covent Garden. Out of these lectures grew the book before you, first published in Latin under the title of " *Medicamentorum Formulæ ad varias medendi intentiones concinnatæ*," and of which this is the first English translation. In 1765 Dr. Smith became Physician to the Middlesex Hospital, and in 1770 was elected an Alderman of Tower Ward, but soon resigned the latter office and removed to Bridge Street, Blackfriars.

His charity is eulogized in this sketch in the following words : " He did what perhaps few physicians in his great practice would have done, he set apart two days for the poor in each week. To the *very* poor he prescribed gratis ; from those of middling circumstances he would never accept more than half-a-guinea ; yet so numerous were the applicants for his advice that he has received *fifty* guineas in a day from those half-guinea patients. From the inferior clergy, from subaltern officers, and from public performers, he made it a rule never to take a fee ; and he has often been known to give pecuniary aid as well as advice."

He died on December 26, 1790, and not long before is said to have remarked to a lady, who consulted him on a pulmonary disorder, " Madam, I am affected in the same manner as yourself, but my case is *mortal!* You, with care, may recover."

The publication in English of his prescriptions is thus excused on p. vii : " The mode of giving medical prescriptions entirely in Latin . . . is really a burlesque upon the common-sense of mankind. Physicians may indeed be able to *scrawl* a Latin prescription (and to preserve the mystery of their profession they often do scrawl in a most unintelligible manner), yet we experimentally know that apothecaries and their apprentices are not always able to develope these learned

enigmas; and hence the most valuable lives may be left at the mercy of a giddy or an ignorant boy." Possibly you will think with me that, even with a clearly written prescription, the most valuable lives were in danger from the treatment.

It is an interesting little book to glance through, for it contains a certain amount of sound advice mingled with much fantastic pharmacy. For instance, in dealing with the treatment of pulmonary tuberculosis, an easily digested diet and pure dry air are insisted upon, combined with a balsamic pill and an expression of millipedes! Among the pharmaceutical agents mentioned as ingredients in these "elegant prescriptions" are emetic tartar, wormwood, calx of antimony, Glauber's salt, saffron, nitre, dragon's blood, steel filings, zedoary, colcothar of vitriol, diascordium, prepared oyster shells, assafœtida, musk, valerian, confection of Paulinus, pill of Rufus, and many others.

For "Chorea Sancti Viti, or St. Vitus's Dance, which is a convulsive disease, probably owing to worms," anthelmintic remedies are advised. Hence Dr. Smith recommends a preliminary emetic of ipecacuanha, followed by a powder of mosaic gold and rhubarb, or filings of tin and conserve of rue, or ½ to 2 dr. of tincture of soot, three times a day, "in any agreeable liquid." "If the disease should not yield to the above, the cold bath and chalybeates will most probably effect a cure."

For intermittent fever Peruvian bark is recommended, preceded by an emetic or aloes and rhubarb.

But the gem of the whole series is the description of "Peripneumonia Notha," which, we are told, has its origin "from a weakened and relaxed state of the vessels of the lungs, and a pituitous lentor, or glutinous disposition of the fluids stagnating in, and obstructing the vessels and glandular follicules," a truly illuminating exposition of the pathology of this disease. Among the prescriptions advised for this evidently serious disorder is the following: "Live Hoglice, one ounce; bruise them and gradually pour upon them old Rhenish wine, Spirituous Cinnamon Water—each three ounces. Having obtained a very strong expression—we are not told whether from the hoglice thus maltreated, or the patient expected to swallow the concoction—add, Antimonial Wine, two drachms; Syrup of Squills, half an ounce. Mix, and take a third part thereof every six hours."

I may mention that "prepared hoglice" are also recommended for the treatment of scrofulous or strumous affections in children.

It is remarkable what a number of filthy decoctions people could

swallow but little over a century ago. I have in my possession an old chemist's bill which I have brought with me. You will see that it ran from October 26, 1728, contains 13 pages, with 638 items, and amounted to £71 13s. 1d., which sum was paid—grim irony—by the patient's executors, on August 20, 1730.

Will the therapy of 1913 afford as much amusement to the doctors of 2013 ?

John Avery (1807-1855).

By Macleod Yearsley, F.R.C.S.

The surgeon whose portrait I am about to show you is one who, when he died at the comparatively early age of 48, had already merited the description accorded to him by the *Lancet* of March 24, 1855, of a "much respected and eminent member of our profession." He is well-nigh forgotten now, but that he deserves to be remembered will, I hope, be apparent from the following short sketch of his all too brief life. From the obituary notice in the *Medical Directory* for 1856 it appears that John Avery was born in 1807, became M.R.C.S.Eng. in 1829, M.D.Paris in 1831, and received the honorary F.R.C.S. in 1843. He began his professional career as a pupil of William Cother, who was one of the surgeons to the Gloucester Hospital, the other surgeon being Robert Fletcher, whose daughter married my relative Dr. James Yearsley, the aural surgeon. Avery later came to London and entered St. Bartholomew's Hospital, where, his biographer says, he "laid the foundation of that distinction as an operating surgeon which he afterwards reached. Unless Mr. Avery had been an excellent anatomist, he never could have adventured on those nice and difficult operations on the palate which have identified his name with some of the important improvements in modern surgery."

After receiving his diploma he continued his studies in Paris and, after taking the M.D. of that University, he, being possessed of an ample fortune, travelled through the various countries of Europe. Whilst he was in Italy war was raging in Poland, and, seeing an excellent field for surgery, he entered the Polish service, and was immediately appointed surgeon-in-chief to a Polish ambulance. He was, however, taken prisoner, his baggage and papers were seized, and

being unable to communicate with his friends he, for many months, to quote his own story, "experienced the novelty of living on tenpence a day." On his release he returned to London and began practice as a consulting surgeon, which, as the quaint early Victorian phraseology of the obituary notice says, " is one of the paths to fame which none but a man of high resolve and immovable patience would select." He became Surgeon to the Charing Cross Hospital, his senior colleague being Mr. Hancock.

He was endowed with considerable mechanical talent, as evidenced by his invention of a lamp " for the examination of the outer passages of the body." This lamp is depicted in the portrait I am about to show you, and for it he received two medals, one from the Prince Consort, as President of the Society of Arts, the other from the Great Exhibition of 1851. The latter I now possess and show here.

The *Lancet* remarks that " by means of his lamp and tubes, and reflectors, he was able to examine the ear, urethra, bladder, œsophagus, and larynx, as probably no surgeon had ever examined them before him," a remark which is of particular interest in the light of modern instruments for these examinations. The portrait which I now show is one painted on ivory and shows John Avery with his lamp beside him.

Avery was especially distinguished as a careful and expert operator, cool and wary, and particularly skilful at cleft palate operations. He originated an improved method of dissecting the soft palate away from the vault of bone, and uniting the flaps thus obtained in the centre. He also made improvements in the exploration and treatment of stricture, but most of his work died with him, as he wrote very little; indeed, save for a few cases reported in the *Lancet*, his only published work that I have been able to find is a paper in the *Lancet* for September 21, 1850, entitled " Illustrations of the Successful Treatment of Cleft Palate by the Division of the Levator Palati, Palato-pharyngeus, and sometimes the Palato-glossus Muscles." He appears to have taken great delight in his work, and the notice from which I have already quoted says, " A handsome stump, a symmetrical fracture, an effaced hare-lip, a cleft palate restored, a stricture relieved, would give him the most heartfelt satisfaction."

His private practice does not, however, seem to have been enormous, for the *Medical Directory* notice remarks : " Mr. Avery's practice was not extensive, and for this various reasons may be assigned. In the first place, the time which he had been before the profession was comparatively short, and no man can acquire a large amount of consultation

JU—9a

practice in this metropolis who has not served a long apprenticeship to popularity; in the next place he was a man of such high honour and sensitiveness of disposition that he retreated from and repudiated the arts which other successful surgeons have not disdained to use in order to fix the unstable confidence of the public." Perhaps this is why the *Lancet* tells us, "Enemies he had none." No doubt, had he lived he would have taken one of the first places among contemporary scientific surgeons. He is described as a delightful social companion and a true friend. What better epitaph can a man require?

The illness from which he died in 1855 began in the spring of 1853 with obscure gastric symptoms, violent vomiting after food and pain, only allayed by inhaling chloroform, of which he used 3 to 4 oz. daily for weeks. He died practically of starvation on March 5, 1855, when the autopsy showed a sound stomach whilst the lungs were riddled with old and recent tubercle which had been undiagnosed during life.

From all accounts John Avery appears to have been a surgeon worthy of remembrance, and it is on this account that I have ventured to bring him to your notice. To quote once more from his obituary notice, "There have been few surgeons who have passed through life with more general affection, or whose death has been lamented with a more sincere regret."
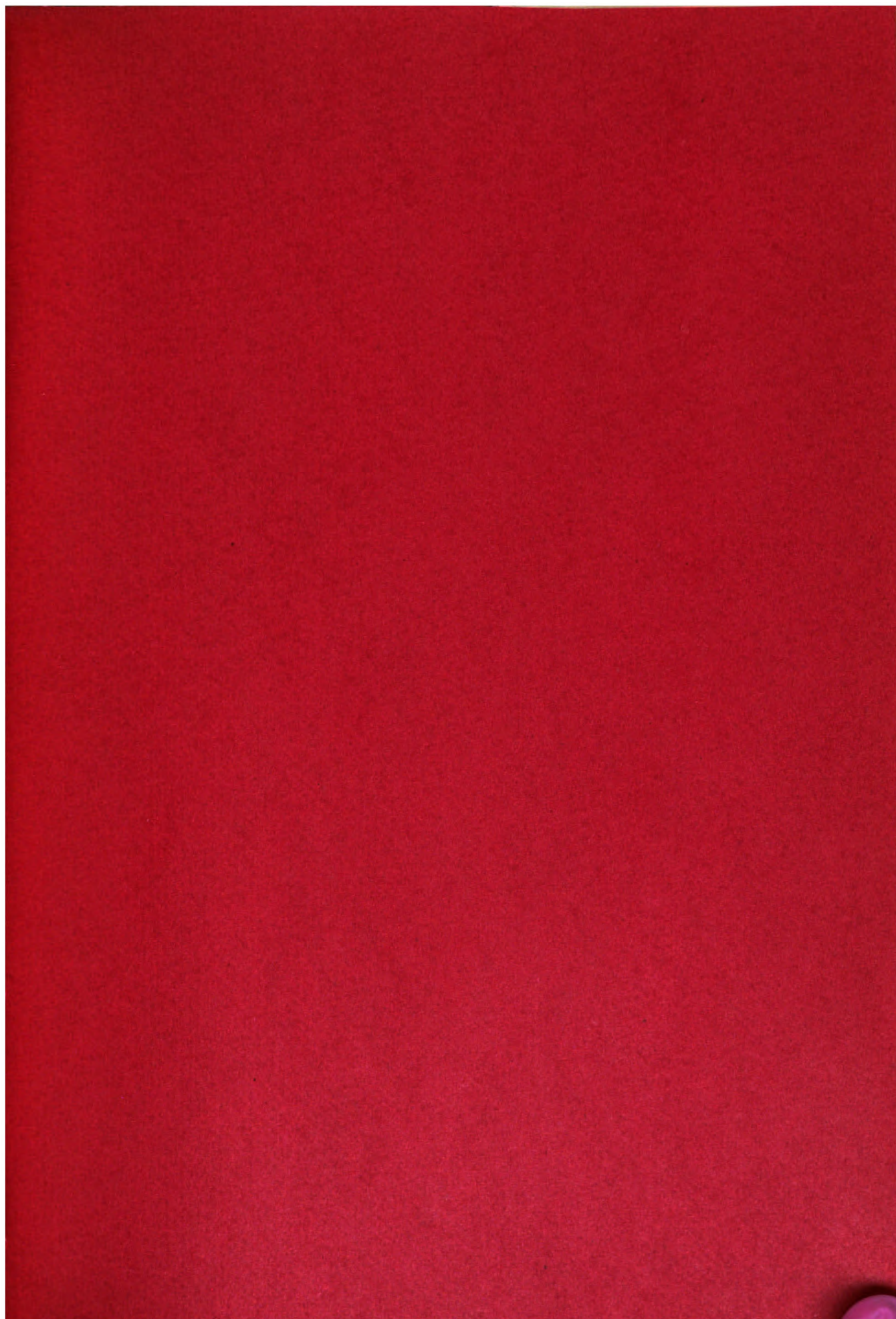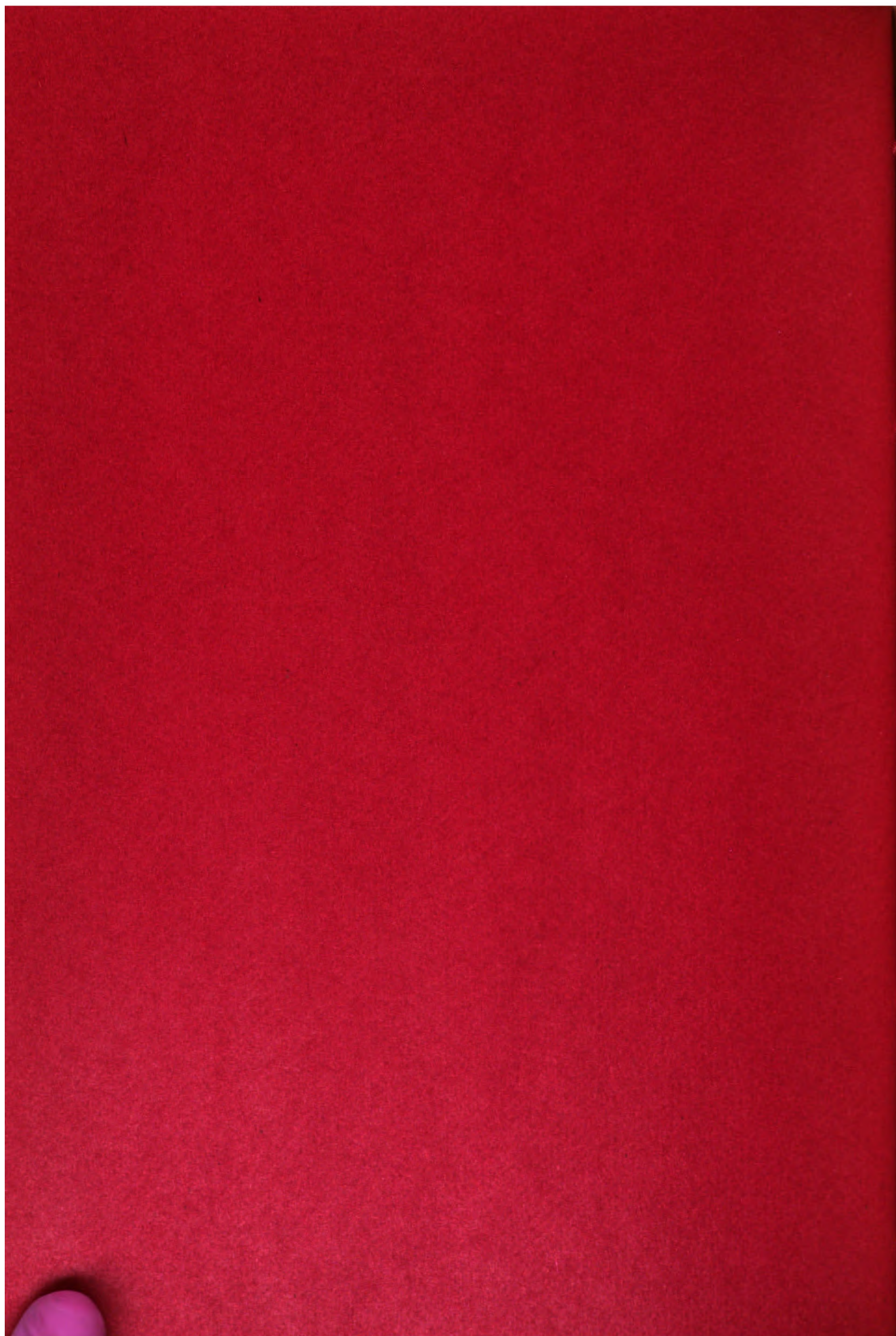
Laryngological Section.

November 1, 1912.

Mr. HERBERT TILLEY, President of the Section, in the Chair.

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Case of Mikulicz's Disease.

By JAMES ATKINSON, M.B.

MALE, aged 33, porter. Symmetrical swellings of both parotid glands. Submaxillary glands are felt to be distinctly swollen when
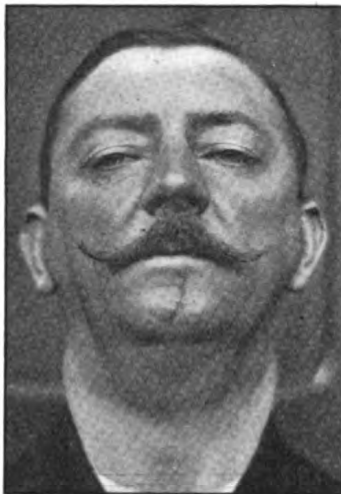
Case of Mikulicz's disease.

examined between the fingers; lachrymal glands not visibly enlarged, but there is undue lachrymation. Glands are felt to be enlarged in posterior triangles of neck and in occipital regions. There is no pain or tenderness. The swellings of parotids first noticed ten months ago. The liver is much enlarged, but there is no enlargement of spleen to be detected. Patient is a little liberal in his allowance of alcohol.

D—13

DISCUSSION.

Dr. D. R. PATERSON said he had taken an interest in this disease from the time Mikulicz first described it, and the first case of it he saw in this country was one shown before the old Laryngological Society. He did not know that this present case could be so described, as there was only one salivary gland definitely symmetrically affected—namely, the parotid. The other salivary glands were doubtful and the lachrymal gland could not be felt. On the other hand there was considerable enlargement of the lymphatic glands of the neck. In the first cases of the condition described by Mikulicz the affection was confined to the secretory glands, and unless the conception of the disease had been extended this case would hardly come under that category.

The PRESIDENT (Mr. Herbert Tilley) said that Osler had described a case in which it was found after death that the lachrymal gland had become fibrous, and there had been a history of its enlargement earlier in the case. If it was thought that Dr. Atkinson's case was lymphadenoma the microscopic examination of a portion of the gland would enable such a diagnosis to be made. The effect of arsenic might be tried in this patient.

Mr. KISCH said the case was of interest because of the enlargement of the lymphatic glands. The disease was supposed to have some relation with lymphadenoma, but in most of the published cases no enlargement of glands was mentioned. In this case both submaxillary glands were enlarged.

Dr. ATKINSON, in reply, said there was considerable enlargement of both submaxillary glands, and also, he believed, of the sublingual glands. It was Mr. Kisch who suggested it was Mikulicz's disease, and he (the speaker) did not know what else to call it. The patient disappeared after the first time he was seen, and was seen again only a few days ago. The urine was normal, and there were no enlargements in the general lymphatic system of the body. He would try arsenic. No enlargement of the spleen could be made out either by palpation or percussion. The liver was much enlarged.

Fibroma of the Nasopharynx.

By HERBERT TILLEY, F.R.C.S.

H. C., AGED 21, applied to the Radium Institute last June in order that a tumour in the right nasal cavity should be treated by radium, because he had been told that the case was inoperable. Examination showed that the right nasal cavity was filled by a firm vascular mass which reached from the vestibule in front to the nasopharynx pos-

teriorly, where it filled and slightly projected from the posterior choana. The patient was anæmic but otherwise his general health was fairly good.

The patient was admitted to University College Hospital, and was operated on by me. Preliminary laryngotomy was not performed as I hoped to be able to plug the post-nasal space securely with a sponge, but it was necessary to open the wind-pipe during the operation because of the severe bleeding and difficulty of administering the anæsthetic. Free access to the nasal fossa and the growth was obtained by turning up the right cheek and upper lip, and removing the ascending process of the maxillary bone. The tumour was very vascular although tough, and it grew from a broad base which appeared to include the posterior ethmoidal cells and lateral wall of the nasopharynx. It was removed by cutting close to its base with strong scissors, and partly by means of a strong wire snare which could be slowly tightened up. The bleeding was very free, and transfusion was employed when the patient was returned to bed.

He made an excellent recovery, and on one occasion I made four deep punctures with the galvano-cautery into what seemed to me a small recurrence in the base of the growth; this has disappeared, and since the patient is 21 years of age I do not anticipate further trouble.

The pathologist's report states that the growth was of a fibrous nature, contained large thin-walled blood-vessels, and in several regions cysts were situated, in some of which evidences of old hæmorrhages were present.

Specimen of Large Fibroma removed from Patient some Seven Years ago.[1]

By Herbert Tilley, F.R.C.S.

Four extensive operations were necessary, but the patient is to-day alive and well, and is a picture of robust manhood. The interesting feature in this case was the fact that a large portion of the tumour grew from the posterior wall of the antrum, and it was from this region that recurrences took place after the first operation.

[1] Vide *Journ. Laryngol.*, 1911, xxvi, p. 213.

DISCUSSION.

Dr. WATSON-WILLIAMS said it required some enterprise to attack a bleeding fibroma, and Mr. Tilley was to be congratulated on his successful result. The growth was approached through the anterior route, and he urged that anterior routes, either by this method or by that which he had himself advocated—namely, splitting the nose and turning out an osteoplastic flap, with removal of the posterior part of the nasal septum—a method of approach which gave a very complete view and control of the area involved, gave more perfect access than the more usual splitting of the soft and partial removal of the hard palate. Sometimes one was inclined to overlook the advantages accruing from an anterior route.

Dr. FITZGERALD POWELL congratulated the President on the result of his case. Tumours such as this, which had probably their origin in the nose, and had not extended very far into the nasopharynx, were easily approached from the front by this method, but where the tumour was large, involving the basi-sphenoid, and, as in a case of his, extending along the pterygoid process, he thought it would be found necessary to perform an osteoplastic resection of the upper jaw or do the modified form of Nélaton's operation, splitting the palate and removing a portion of the hard palate if necessary. For a small tumour the method adopted by Mr. Tilley seemed to be preferable. Many of these tumours in the nose and nasopharynx showed malignancy, and he thought from the recurrence that there might be a sarcomatous factor in this case. The difficulties found and described by the President in performing the operation were an object-lesson, and very forcibly indicated the necessity for a preliminary laryngotomy, which should always be performed; it enabled us to control hæmorrhage, and assisted considerably the administration of the anæsthetic.

Mr. HARMER agreed that preliminary laryngotomy was good in these cases, and sometimes it was desirable to go further. In a case of very large nasal fibroma, which he reported some time ago to the Clinical Section,[1] which gave the patient a frog face and displaced both eyes outwards, the tumour was very vascular and pulsating, and several London surgeons pronounced it to be inoperable. He first did a laryngotomy, and temporarily ligatured both internal carotid arteries, and then the whole tumour was taken away, almost without bleeding. The arteries were gradually released afterwards, and bleeding points dealt with as they appeared. In such cases the question of temporary ligature should be considered.

Mr. E. D. DAVIS asked whether the growth was attached to the basi-sphenoid or the basi-occiput, as it was stated that fibromata arose from the perichondrium or the plate of cartilage between the basi-sphenoid and the basi-occiput, and that such fibromata did not recur after ossification of that cartilage about the age of 25.

[1] *Proceedings*, 1910, iii (Clin. Sect.), p. 122.

Dr. WESTMACOTT said he had had a similar case in a boy aged 16, in whom the growth originated from the posterior ethmoidal region. There was first enlargement of the inferior turbinal and some protrusion of the cheek, pointing to invasion of the antrum. On removing the turbinal he found a good deal of polypoid material in the antrum and in the middle turbinal region, which was cleared out. Five months later the patient returned with the nose filled by a solid mass, which was pink and shiny in appearance. He again operated. He usually had the patient's head hanging over the table, so that there was nothing to interfere with the anæsthetist, nor fear of blood entering the larynx. He found he could not remove the mass, as it was so hard and solid, and the hæmorrhage was so profuse ; after getting away as much as he could with the snare and very strong scissors, he had to leave it. He saw the patient again only a few days ago, and found the nose was filled with a large single growth. There was slight protrusion of it into the nasopharynx, otherwise that part was clear. The question was whether he should do a formidable operation to remove it, or leave it alone.

Dr. D. R. PATERSON said he had been under the impression that fibroma originating within and confined to the antrum was a very rare condition, but this year, at the meeting of the German Laryngological Society at Hanover, he saw three specimens of fibromata of some size which Professor Manasse had removed from the interior of the antrum.

Dr. DUNDAS GRANT said that if these growths were attacked before they became very large, much could be done by passing a raspatory through the nares and detaching the periosteum from the bone, vigorously guiding by a finger in the pharynx. The growth could then be got away with much less hæmorrhage than might be expected. In a notable proportion of the cases exhibited at this Section the growths had their origin in the antrum. He had himself described one case in which it was possible, with the finger in the pharynx, to feel the adventitious opening in the inner wall of the antrum through which the mass protruded.

Mr. HORSFORD said it seemed agreed that preliminary laryngotomy was necessary in these cases, and he asked if the method had been tried which was known as the per-oral method. He had seen this used in Berlin.

The PRESIDENT, in reply, said he would not split the soft palate for such a case if he could gain good access to the growth otherwise. One obtained this through the nose by turning up the cheek by an incision in the gingivo-labial fold, and removing the ascending process of the superior maxilla and cutting through the floor of the nasal septum : the whole of those structures could be turned upwards, so that the tumour was fully exposed. In this case the microscope revealed no sarcomatous elements. With regard to preliminary laryngotomy, he made a mistake in this case, for he had thought he might manage without it, because the growth did not fill the nasopharynx on the right side, and that it would suffice to pack a sponge in tightly. But the bleeding was

very free, and directly he began to manipulate the growth the hæmorrhage seemed to come from the whole surface rather than from any particular vessels. In the midst of the operation, as the boy was becoming faint, and there was difficulty in administering the anæsthetic, he put in a laryngotomy tube ; he thought he would in future put one in first of all, even though it might prove afterwards not to have been necessary. Mr. Harmer's suggestion as to ligation of the carotids was valuable, but in the four cases of the kind he had had in twenty years he had not yet seen the need of that procedure. In this patient there had been a recurrence in the postero-lateral part of the nasal fossa, which had appeared in less than a month. During the past month he had punctured it on two or three occasions with the galvano-cautery, and already there was a distinct diminution in the size of the swelling. In reference to Mr. Westmacott's case, he suggested that he should try Voltolini's method, or electrolysis, for in America cases had been reported in which large growths had been cured by electrolysis and practically without any loss of blood. Or the galvano-cautery loop could be tried. In any future case of his own of this character he intended to try the galvano-cautery, as the experiences he had had with this class of case were very trying; this particular patient was so weak after the operation that it was thought wise to transfuse him. One might carry out Dr. Grant's suggestion in cases where the tumour was smaller, but he could not conceive it being practicable in such a case as he (the speaker) had shown to-day, for it would necessitate one working more or less blindly through the nasal cavity. He had brought the bottle specimen of another case of large nasopharyngeal fibroma, because it was in reference to this case that Dr. Bryson Delavan had made some very uncomplimentary remarks when speaking on this subject before the American Laryngological Association.[1] Dr. Delavan not only condemned the method of operation, but inaccurately recorded the history of this case, the operative details, and left the reader to understand that because there was no recurrence within three months the patient was therefore reported "well." As a matter of fact, the history was that the patient from whom this growth was removed was that day "quite well." He stood 6 ft. 2 in. in height, a picture of health, and was in the South African Police. The recurrence took place from that part of the tumour which grew from the posterior wall of the antrum, and when that was removed at the fourth operation no further growth took place. Dr. Delavan proceeded to say, "These few instances suggest first the absolute lack of knowledge shown by many operators of this type of case. Again they show the wretched manner in which reports of such cases are made. Nor is bad history confined to this country: some of the worst instances are to be found in foreign literature, especially the German." If Dr. Delavan could see these two patients Mr. Tilley thought he would wish that he had been less severe in his criticisms and had taken greater care to verify his references.

[1] *Vide* "Transactions of the Twenty-third Annual Meeting of the American Laryngological Association," 1911, pp. 16-17.

Photographs of a Patient suffering from a Chondro-sarcoma, originating in the Left Nasal Cavity.

By HERBERT TILLEY, F.R.C.S.

MISS I., aged 16, consulted me on July 7, 1910. Her only symptom was inability to breathe through the left nostril. Examination showed the left nasal cavity completely filled with a smooth firm growth
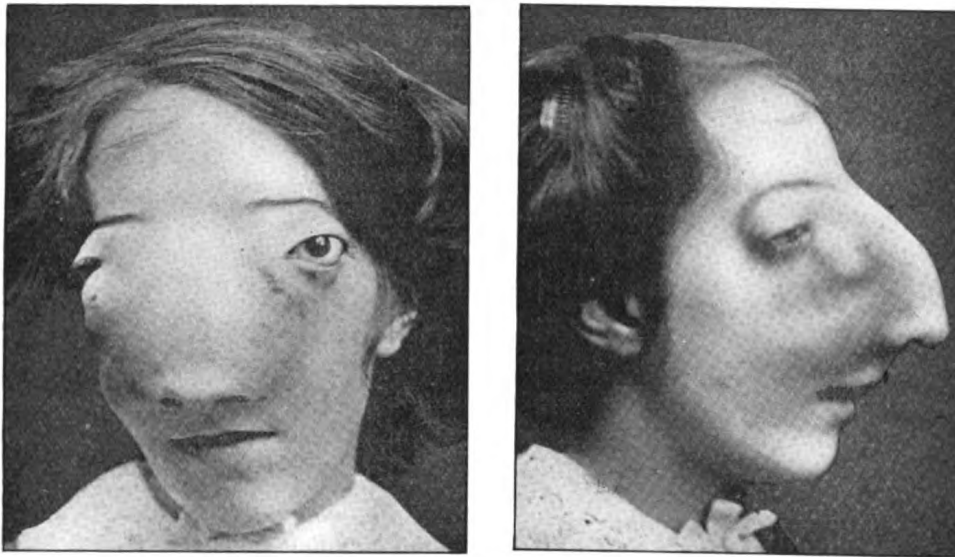
Chondro-sarcoma of the nose.

which closely resembled a cystic enlargement of the middle turbinal. It reached from just within the vestibule to the posterior choana, and a probe could not be passed between it and the surrounding parts. Exploration showed that it was a solid growth. The antra were clear on transillumination. Septum much deflected to right. She was admitted into University College Hospital and the growth fully exposed by turning up the upper lip and left cheek and removing the ascending process of the left maxillary bone. Care was taken to try to remove the growth *in toto*, but it was very friable and of the consistence of a hard frozen ice-cream, and the site of origin could not be ascertained. Every trace of it was removed, and the patient rapidly recovered, but in a few weeks recurrence was noted.

During my illness Mr. Hett operated again and found the growth had penetrated the septum and destroyed some of the right ethmoidal region.

Recurrence again took place, and the patient consulted other surgeons, who did not advise operation.

The photographs were taken towards the end of July, 1912.

Two Cases of Bilateral Œdema of Nasal Septum.

By J. F. O'MALLEY, F.R.C.S.

Case I.—M. J. R., female, aged 20, cigarette-maker, came to hospital complaining of her nose getting broader and of her inability to breathe through it. The sense of smell was also absent. On examination polypi were readily seen on both sides, with a septal deflection to the left. She was admitted for operation, and on removal of the cocaine and adrenalin gauze packing the bilateral swellings on the septum were first observed. A submucous resection was done and the polypi removed. The latter are recurring, but the septal swellings remain practically the same size. The septal cartilage, bone, and periosteum were healthy, and the œdema was apparently limited to the mucous membrane. Transillumination shows good crescents on both sides.

Case II.—L. M., male, aged 11, came to hospital because his nose was getting broader and he could not breathe through it. He also complained of continual " colds in the head " and headaches, and gave a history of three years' duration. On examination, the left nasal fossa was seen to be completely blocked with a pale red, soft, mobile mass. It lies in the centre of the passage with a cleft on each side of it. A probe passed along the inner cleft is soon stopped against the base of the swelling on the septum, but the outer cleft is permeable. This can be seen under the use of cocaine and adrenalin. The condition on the right side is similar, only less pronounced, as the junction of the base of the swelling and septum can be more easily seen. The middle turbinates are small " flapper "-like bodies pushed up against the outer wall of the middle meatus. No polypi were seen during examination, but the condition under the middle turbinates has not been investigated. Transillumination shows good crescents.

DISCUSSION.

Mr. CLAYTON FOX said these cases might be placed in the same category as the condition frequently seen in large clinics—namely, œdema and hyperplasia of the tubercle of the septum. There was in such cases a large amount of glandular tissue, some lymphoid, and possible cavernous tissue present. The slighter cases could be dealt with by the galvano-cautery, and the more pronounced either by snaring or lateral incisions followed by gauze packing.

Dr. DAN MCKENZIE said those cases formed two further instances of a condition which was really due to ethmoidal disease. Last year he showed a similar case, in which there was œdema on both sides of the nasal septum; and this was not uncommon in ethmoidal suppuration. Probably the same cause which induced the polypi from the middle turbinal also produced the œdema of the upper part of the septum. In these cases the œdema seemed to be limited to the upper part of the nasal septum—namely, the bony part. He would like to have an explanation of this.

The PRESIDENT said he had a private case in which similar appearances were present, not only on the "tubercle of the septum," but there was a distinct prominence on the floor of the nasal meatus, very like a polypus growing from the nasal floor.

Denker's Operation for Maxillary Antrum Suppuration.

By DAN MCKENZIE, M.D.

GIRL, aged 19. Nasal discharge (right side) of over one year's duration. Usual signs of antrum suppuration. Pain in face over right antrum present. Denker's operation three months ago; cure. The essential feature of the Denker operation is the removal of the anterior bony angle of the antrum, so as to render continuous the openings in the canine fossa and in the nose. In this case the operation was performed through the mouth under chloroform. After-treatment is enormously facilitated by the ease with which the antrum can be drained and washed out; one can look straight into the antrum on anterior rhinoscopy.

There is a somewhat serious drawback to the operation. Cases have occurred (I am told) in which, subsequent to the operation, cicatricial contraction has induced displacement of the ala nasi on the operated side. There is no sign of deformity in the present case.

DISCUSSION.

The PRESIDENT said there were two reasons why this operation might not be the best for general adaptation. First, similar good results might be obtained by similar measures; and, secondly, he knew of one case in which stenosis of the lachrymal duct had occurred which necessitated probing of the duct for several months.

Dr. D. R. PATERSON said he had done this operation for some time, usually for growths in the nose. He had done it a few times for ordinary chronic suppuration of the maxillary antrum, and they had all done well, and with no resulting deformity of the ala.

Dr. McKENZIE, in reply, said it did not strike him as a very large operation, but the incision had to be a little farther in front than usual. He kept below the inferior turbinal. The possibility of interference with the nasal duct was obvious, though he did not think it was greater in Denker's operation than in others. He desired to emphasize the question of deformity, as he had been authentically informed since this patient had been operated on that cases of displacement of the ala from cicatricial contraction had occurred; therefore he would not feel justified in performing the operation again.

Tuberculosis of the Tonsils and Cervical Lymphatic Glands.

By DAN McKENZIE, M.D.

THIS little boy came under treatment for "enlarged tonsils and glands in the neck" about nine months ago. The tonsils were enucleated and examined for tuberculosis. The microscope showed plentiful giant cell systems in the left tonsil, with a few in the right. The lymphatic glands on the left side of the neck are more affected than those on the right. The patient is being treated by tuberculin.

The case is of special interest for two reasons: First, it exemplifies one of the two types of tonsil tuberculosis to which attention was drawn two years ago in a discussion at the Section, that, namely, of the disease in the substance (and not on the surface) of the tonsil; there is no ulceration; it is associated with enlarged cervical glands; and it occurs in a child. In the other variety the tuberculosis is ulcerative, superficial, secondary to pulmonary disease, and occurs in adults. The second point of interest is that the case emphasizes the importance of enucleating the tonsils when the cervical lymphatic glands seem to be tuberculous.

The PRESIDENT said he had seen a case where there were enormous tuberculous glands, and operation had been refused by a surgeon because extensive cicatricial contraction in the neck would ensue.   Tuberculin was given for six or eight months, and the glands had practically disappeared.

A Simple Tonsillotome.

By JAMES DONELAN, M.B.

THIS tonsillotome has been designed by the exhibitor as an improvement on one introduced by him some fourteen years ago (also shown) which was a modification of the original instrument of Morell Mackenzie.   This modification consisted in the removal of the upper of the two parts of the slit ring between which the blade finishes the cut.   This slit was difficult to clean and often a cause of the more rapid deterioration of the edge from retention of imperceptible moisture.   At the same time Mackenzie's rounded edge was given a pointed form.   In order to diminish the much dreaded risk of the excised tonsil falling into the larynx a flange was added on each side of the lunette so as to grip the expanding edge of the cut tissue.   It did this very well, but it was found in practice to be a superfluous precaution, as the tonsil was usually pinched by its capsule between the blade and holder, unless when the blade happened to be a little too sharp and cut through the posterior part of the capsule without holding any of its fibres.

The new instrument has been devised with the idea of getting rid of everything except the really essential parts.   It consists, really, of only two portions if, as recommended, the handle be supplied as a fixture. The small screws, springs, and nuts of previous forms of the Mackenzie tonsillotome have been done away with.   The resiliency of the blade and holder are availed of to give the necessary spring, and this is increased up to the end of the cut by making the back stop of the blade travel up an inclined plane.   Two little studs act as a front stop, and these also serve instead of flanges to catch the excised tonsil by its capsule.   The blade can be rapidly detached and the holder quickly and thoroughly cleaned.   The handle has been fixed at the angle recommended by Dr. Kelson.

The tonsillotome shown is the middle one of the three sizes most commonly in use.   It is the original working and trial model made up by the Holborn Surgical Company from an old instrument, and has,

therefore, not so good a finish as those to be made of entirely new materials will have. It has, however, been thoroughly tested in several operations and has proved quite satisfactory.

Dr. J. DONELAN said he had used it in twenty cases. It caught the tonsil very effectually when it was cut. It was not intended in any way in opposition to the modern revival of the operation by enucleation, but in the large majority of primary tonsillotomies, especially in children, he believed the old operation would continue to be practised, and that this instrument would be found to possess the merits claimed for it in the description given.

Epithelioma of the Soft Palate.

By FRANCIS MUECKE, F.R.C.S.

E. M., MALE, aged 44. Hard, warty, ulcerating growth on soft palate, situated just behind and above third left molar tooth of jaw. The size was slightly less than that of a threepenny bit. The edges were raised and indurated. History was indefinite; the ulcer had been noticed for about three months, and had caused a little pain. A small piece was removed for examination, and the report was: "Squamous and horny carcinoma in early stage." The anterior triangle of the neck was completely cleared, and all glands, including the submaxillary, were removed. A laryngotomy was then done for anæsthetic purposes, and the upper part of the pharynx plugged. The growth was freely and boldly removed, allowing about ¾-in. radius. Bleeding was profuse. The cut edge of the soft palate was approximated by stitches to cut edge of the anterior pillar, and the deep wound firmly plugged to prevent hæmorrhage. Next day the plug was removed, and no hæmorrhage resulting, the laryngotomy wound was closed; healing was rapid and satisfactory. Microscopical section shown.

I am greatly indebted to Mr. Hunter Tod for permission to show this case.

Double Abductor Spasm, caused by Vocal Overstrain (?)

By Francis Muecke, F.R.C.S.

A. L., MALE, aged 30. First seen in July last, when he came to the hospital with complete loss of the singing voice and painful and husky speaking voice. Onset was gradual. First noticed loss of high notes, then pain after singing, and then husky voice, till he had no voice whatsoever, the total process lasting seven months. He practised all the time most assiduously and all too frequently to try and clear a supposed obstruction. The method used was undoubtedly faulty, and the voice was forced beyond its natural limits. The laryngoscope showed the cords closely approximated in the middle line; they were curved, so that their anterior and posterior extremities almost touched; both cords were red and injected. No outward movement took place on deep breathing. Complete rest was ordered.

He has since been seen on five occasions, and the local conditions have altered somewhat on every occasion; sometimes very fair outward movement, sometimes very poor. The right cord has always been the better of the two, and on the last occasion the left appeared to have no movement whatsoever. He says he is enormously improved and that the speaking voice is now normal. No cause, such as aneurysm, &c., was found.

DISCUSSION.

Sir Felix Semon said he would ask Mr. Muecke to change the title of this case,[1] because he felt that any one reading of double abductor paresis caused by vocal overstrain would think a new kind of cause for abductor paralysis had been encountered. Probably all who had inspected this patient had found there was no disease at all, and that the vocal cords moved well outwards, as described in the second part of the notes. His own opinion was, not that abductor paralysis had been caused by the overstrain, but spasm, analogous to writer's cramp, due to overaction on the part of the abductors, and that in consequence of that perverse action the cords could at times not be abducted as well as they should be. This was an entirely different thing from abductor paralysis associated with organic disease.

[1] The original title given to this case was " Double Abductor Paresis."

Mr. MUECKE replied that he would certainly accept Sir Felix Semon's suggestion. He used the word "paresis," simply to indicate that there was no movement of the cords at the time, not to signify paralysis. He wrote the notes a month ago, and when the patient came a fortnight later there seemed to be a cure; he thought that was so now, and that any lacking movement was functional.

Tonsils and Cervical Glands removed Post Mortem from a Man, aged 47.

By A. R. TWEEDIE, F.R.C.S.

SECTIONS of the growths on both sides suggested an epitheliomatous infection. The specimens were submitted for confirmation of this latter point.

DISCUSSION.

The PRESIDENT suggested that the specimen might be referred to the Morbid Growths Committee, and this was agreed to.

Sir STCLAIR THOMSON asked if both tonsils exhibited epithelioma? He had had an analogous case, the growth being sarcoma, in a girl aged 17. Mistakes were made about it by several eminent men, because both tonsils looked so much alike. There were glands on each side, and the tonsils projected. They had been punctured. What attracted his attention was the hardness of the glands. He shelled out the tonsils under an anæsthetic, and they proved to be sarcomatous. The girl was now dying in the country.

Sir FELIX SEMON did not see why both tonsils should not be epitheliomatous from contact, as was sometimes seen in the case of the lips, or the vocal cords. One side might have been infected from the side originally infected.

Mr. HOPE remarked that two years ago, at St. Mary's Hospital, there was a man suffering from sarcoma cutis, and both his tonsils were found to be sarcomatous, as proved by removal and subsequent sectioning.

Cartilaginous and Fibrous Growth removed from a Girl, aged 18.

By A. R. TWEEDIE, F.R.C.S.

THE site of origin was apparently the left Eustachian cushion or the area between the latter and the upper end of the adjacent posterior pillar. It occupied the greater part of the nasopharynx. (Sections exhibited.)

Mr. WESTMACOTT said that five years ago he recorded a case similar to this. The growth was so large that its removal from behind the soft palate was difficult. The patient was a boy aged 12, and there had been no recurrence. It was a pure chondroma. It filled the whole nasopharynx, and was growing forward into the left nasal fossa.

Specimen showing (?) Ulceration of the Left Internal Carotid Artery from a Boy, aged 1 Year 8 Months.

By A. R. TWEEDIE, F.R.C.S.

THE boy had been ill three weeks before with a " sore throat," from which he had been regarded as convalescent by his doctor for some four days. When first seen by the exhibitor there had been alarming intermittent attacks of hæmorrhage from the left ear for the last thirty-six hours, giving ground for suspicion of some aural lesion. There was no sign, however, of middle otitis or mastoid disease, but the left peritonsillar area was infiltrated and injected, and the parotid and submaxillary lymph glands were enlarged. An investigation under an anæsthetic was advised and carried out some two hours later when an urgent tracheotomy was required. After the patient had then recovered, on opening the mouth the left half of the soft palate was seen to be bulging markedly forward and a peritonsillar incision here evacuated about an ounce of blood-clot. As there was also a semi-fluctuant swelling behind the sternomastoid, an incision was made here too, and the resulting cavity found to communicate with both the peritonsillar and retropharyngeal spaces. The patient's condition did not admit of more than merely packing this wound with gauze, and in spite of all attempts he died about half an hour later.

Post mortem : An " ulcer " was found in the internal carotid immediately below the base of the skull, the adjacent lymph glands were enlarged, but no naked-eye sign of pus could be seen. The bleeding had reached the external auditory meatus via a fissure of Santorini. The middle ear was intact and healthy.

Dr. WATSON-WILLIAMS said he was reminded of a case several years ago at the Royal Infirmary, Bristol, that of a boy who was to have been operated upon for adenoids the following day : but the patient, almost suddenly, died from copious hæmorrhage. It showed how dreadful a position might arise if one operated for adenoids without being aware of this condition. He believed in that case the trouble was due to a breaking-down tuberculous gland, which seemed to have opened the carotid artery.

Epithelioma of the Larynx in a Man, aged 28.

By Sir StClair Thomson, M.D.

A MICROSCOPICAL section from the case shown by Dr. Noel Bardswell on May 3, 1912.[1]

When this patient was shown in May last he was examined by several members, but no one suggested malignant disease. Sir Felix Semon said he did not think that a diagnosis was then possible. An exploratory laryngo-fissure was started, and the cartilage was found to be replaced by a malignant growth. No operation was possible. In the *Proceedings* of the Section for March 1, 1912, p. 93, will be seen the report on an epithelioma of the larynx removed post mortem from a man, aged 23. That I should be able to show two cases of epithelioma of the larynx within three months, in patients aged respectively 23 and 28, gives rise to the suggestion that malignant disease is becoming more common in early life.

Two Cases of Radiçal Frontal Sinus Operation (Killian).

By Sir StClair Thomson, M.D.

THESE two cases are shown (1) on account of the severe headache which impelled the patients to seek relief at any risk ; (2) to illustrate the very satisfactory cosmetic result ; and (3) to show the complete cure of suppuration.

[1] *Proceedings*, 1912. v, p. 151.

Case I.—Mr. R. C. K., aged 30, is a trooper in the South African Police. For nearly six years he had a discharge from the left nostril, with such severe left frontal headaches that he came to England with the determination, as he himself expressed it, to either get cured or put a bullet through his head. In July radical operation was carried out on his left frontal, ethmoidal, and maxillary sinuses. He returns to South Africa this month completely relieved of all headache, and with marked restoration in general health.

Case II.—Mrs. A. T. This patient was also operated on in July. She is a hard-working woman from the country, and begged for relief, although warned of possible risks of the operation. Operation on the right maxillary sinus failed to relieve her, and a complete Killian was therefore carried out on the right frontal sinus. She has been absolutely relieved of all trouble of headache and discharge.

Photographs and skiagrams further illustrate the conditions.

DISCUSSION.

Dr. D. R. PATERSON asked whether Sir StClair Thomson had anything to add as to the method of dealing with the wound in these frontal sinus cases. His own practice recently had been to leave the eyebrow wound open for a week, making a secondary suture a week later. There was perhaps not such a fine linear scar then, but still some months afterwards the scar was hardly noticeable.

Dr. WATSON-WILLIAMS suggested that paraffin injections might be used in such cases. Formerly he had used injections rather too early, before the tissues over the depression became quite lax. But in one case so treated, in which the patient stayed away for a year before coming again, the effect of the injection was admirable.

Dr. DONELAN, discussing the question of leaving the external wound open, said it was of course possible, even a considerable time afterwards, to do a plastic operation and bring the edges into nearly perfect apposition. With regard to paraffin, though it was often talked about he did not himself attempt to use it in frontal cases. From his experience of it in other deformities he thought that, perhaps after a long interval, injections of the variety that could be used cold by means of a syringe, such as that of Alexandre, would probably be found safest and likely to yield the best results.

Dr. DAN MCKENZIE said the reason for leaving the wound open was that it was dangerous to close it, and Killian was one of those who had pointed that out, saying that it might induce osteomyelitis. The difficulty connected with subsequent suturing could be overcome by inserting the sutures at first, and not tightening them until later.

D—14

Mr. HOPE said that in one case in which a depression occurred it was made to disappear by massage alone ; and there was now none to be seen.

The PRESIDENT agreed that the external wound should be left open.   A few days since he had operated on a large right frontal sinus, in which he employed Killian's method.   He sutured the outer part of the eyebrow, and put one suture above the internal canthus.   One would prefer to sew up immediately, because of the "bridge" of bone which, if it became dry from exposure, might become necrosed.   The experience of most men showed that to close a frontal sinus wound at the time of operation was risky ; he had lost two cases by doing that, and he believed it was the cause of osteomyelitis of the frontal bone—e.g., there was obstruction to free drainage.   If infection elements got into the diploë, he did not know any means of saving the patient's life, whereas if the wound was left open one could inspect the parts, and provide free drainage.   When using paraffin injections there was often a chance that something might go wrong.   He had not seen many cases in which paraffin injection had been a success ; here it would have to be injected deeply. He had spent one and three-quarter hours in dissecting paraffin out of a region which had been injected by a "beauty specialist," and from whence it had spread to neighbouring regions, making the lady such a horrible sight that she had not been outside her garden gate for four months.   The paraffin used was semisolid.

Sir StCLAIR THOMSON, in reply, said it was news to him that Killian now kept the frontal sinus wound open in all cases.   His own recent cases he had closed, as he found as much danger from leaving them open as from closing them. In some of the former cases there had been reinfection of the wound. Moreover, there was anxiety about the bridge.   The question of closing the wound depended largely on whether one was certain of having got into all the little galleries, especially the fronto-ethmoidal, behind the bridge ; if so, then closing of the wound he regarded as a distinct advantage, not only from the æsthetic standpoint, but because he believed in keeping up pressure ; he kept a firm pad above the bridge, and another underneath, and pressed these parts in a direction as if they were to meet.   He thought frontal sinus operations were not now done as often as formerly, but that they were now done better ; he did not have the same anxiety at the present time which he had in former years in these cases.   In unhealthy subjects, in whom the material was fetid, he left a drain at the outer angle, and watched for puffiness.   The question of the use of paraffin injections came up periodically at the Section.   There was certainly some slight deformity resulting, but not disfigurement ; he doubted if even a Bond Street "beauty specialist" could improve this depression.   In a year the deformity would be scarcely visible.   Members who used paraffin should show photographs before and after.

Malignant Disease of Left Sphenoidal Region; Proptosis with Blindness of Eye on same Side; Enlarged Cervical Glands on both Sides.

By HUNTER TOD, F.R.C.S.

MALE, aged 52. A year ago noticed bulging of left eye, and that sight was beginning to fail. Was seen by Mr. Lister, who found there was optic atrophy, and considered the cause might be a growth originating behind the orbital cavity. As there was also considerable headache, and slight nasal obstruction on the same side, the patient was sent to me. Multiple polypi were found within the nose, and also the middle turbinate was enlarged, and a slight amount of mucous pus could be seen by posterior rhinoscopy in the region of the superior meatus.

It was decided to explore the sphenoidal sinus in case this might be the cause of the ocular symptoms, although the proptosis could not be explained by the mere presence of suppuration within the sphenoidal sinus. On removal of the middle turbinate the sphenoidal opening could be seen, and its anterior surface appeared normal. On removal of the anterior wall no pus could be seen, but the interior of the sinus seemed red instead of the normal white appearance. On probing the posterior wall it appeared soft, so much so that malignant disease was suspected, although nothing definite could be discovered. The patient soon left the hospital (April, 1912), but returned two weeks ago.

The proptosis is still about the same, but there is complete blindness. A growth can be seen springing from the sphenoidal region, and enlarged glands can be felt on both sides.

The case is of interest in that proptosis was the first sign of the growth. The complete absence of headaches and neuralgia may perhaps be accounted for by the relief of tension due to the early removal of the anterior wall of the sphenoidal sinus.

DISCUSSION.

Mr. TOD said that no microscopical sections had been made. There was no bleeding, except on probing. He would be glad to know whether any treatment could be applied.

The PRESIDENT considered that operative treatment was out of the question in the case, and, unfortunately, radium, even in large doses, was of no use in squamous-celled epithelioma.

D—14a

Marked Infiltration of Ary-epiglottic Fold and Ventricular Region of Right Side of Larynx, together with Partial Fixation of Vocal Cord.

By HUNTER TOD, F.R.C.S.

MAN, aged 30. Hoarseness, which was first noticed seven months ago. No pain, and no loss of weight. Chief trouble is attacks of spasmodic coughing, worse at night. ? Diagnosis.

DISCUSSION.

The PRESIDENT thought the right cord was not regular, and the appearance suggested tubercle. He understood that tubercle had been discovered in the lungs since the case first came under notice.

Dr. DUNDAS GRANT said that unilateral limitation when present in tuberculous disease was apt to trip one up in diagnosis, but he had seen several cases of it recently. In one, that of a lady, there was extensive growth confined to one side of the larynx ; it was so completely unilateral that it could scarcely be believed that it was tuberculosis; it looked more like gumma or malignant infiltration. The microscope revealed its tuberculous nature. Members might remember a case of erroneous diagnosis which he brought before the Section. His primary diagnosis was tubercle, but this was thought to be contra-indicated by the curious microscopical appearance. It turned out, however, to be tubercle.

Tertiary Syphilis and Ulceration of Larynx, causing Laryngeal Obstruction, treated by Neo-salvarsan.

By HUNTER TOD, F.R.C.S.

WOMAN, aged 38. Three weeks ago hurriedly admitted into the hospital in order to have tracheotomy performed for laryngeal obstruction. Symptoms not being urgent, tracheotomy was not performed, but some relief obtained by giving an injection of morphia, ice to suck, and cold compresses to neck. On examination the whole larynx looked red and congested, the vocal cords appearing as fleshy bands. Extending below the vocal cords, chiefly on the left side, was a large ulcer with a sloughy base. Two days after admission 0·9 grm. of neo-salvarsan

was injected into the vein in the arm. This was repeated three days later. Within twenty-four hours after the first injection there was decided relief. The ulceration is healing rapidly, and is now very slight in comparison to what it was. The rapid action of neo-salvarsan is obviously a matter of importance in such cases, especially as a means of avoiding tracheotomy.

DISCUSSION.

The PRESIDENT considered it a very good result, and it was valuable knowledge that tertiary ulcerations might get well so quickly by this method. If one gave iodide of potassium in these cases, one must be prepared for swelling of the soft parts of the larynx, which might need a hurried tracheotomy.

Mr. WAGGETT said, apropos of the curative effect of salvarsan, that he had a case in which the patient had a syphiloma in the larynx so large that tracheotomy seemed necessary. After one injection of salvarsan it cleared up in a few days. The patient refused a second injection and the mercurial treatment suggested. That occurred a year ago, and he returned recently with the larynx quite well, but with a large mass of glands in the neck.

Dr. FITZGERALD POWELL said that some time ago this question was discussed at this Society, when some specialists from Aix-la-Chapelle were present and gave their opinion. It was generally admitted that in some cases initial improvement took place from the injection of salvarsan, but that it was found absolutely necessary to continue the use of iodide and mercury, or mercury, by injection or inunction; that he thought was the experience of most people — it was certainly his. It must not be forgotten that danger to life attended the injection of this drug, and the patients should be informed of the risk and possibilities of the treatment.

Dr. DONELAN said that a large number of cases of syphilis had now been treated with salvarsan at the Italian Hospital. At least two injections were always given. Recurrences were now coming in, some of them as early as six or eight months from the time of the injections. The already large mortality from heart failure, acute arsenical poisoning and other symptoms reported by so many authorities should not be lost sight of when selecting it in preference to mercurial inunction. At the same time there would always be urgent cases like the present in which its rapid, though apparently somewhat temporary action, would prove of the highest value.

Dr. D. R. PATERSON was able to confirm the excellent results from salvarsan in cases of syphilitic laryngeal stenosis. He had seen rapid disappearance after one dose. One case occurred eighteen months ago; the patient had since been on iodide and mercury, and there had been no recurrence.

Mr. TOD replied that he was glad that the President had mentioned treatment by iodides. He agreed with the President that the giving of iodides by causing œdema, often increased the obstruction, and necessitated tracheotomy. It was the rapid and beneficial action of the neo-salvarsan and the avoidance of the internal administration of iodides which he wished to bring before the notice of the Section.

Faucial Mucous Tubercles, Hunterian Sore on the Back of the Neck.

By H. J. DAVIS, M.B.

WOMAN, aged 25, with faucial mucous tubercles. The primary Hunterian sore is in the middle of the back of the neck. She attributes this to scratching herself with a comb. The patient is six months pregnant. Husband healthy.

Photographs showing primary lesion and large collar of glands exhibited.

Enlarged Tonsils. (?) Lympho-sarcoma or Lymphadenoma.

By H. J. DAVIS, M.B.

WOMAN, aged 38, with large ragged tonsils. There is a large indurated mass of glands in the side of the neck. She states these have been there for four years. The case is either one of lympho-sarcoma or lymphadenoma.

DISCUSSION.

Dr. DAVIS said he had had a further report that the Wassermann reaction was positive ; but the case did not look to him like one of syphilis. There was a tumour behind the palate, but he did not know what was the cause of the enlargement of the glands.

Dr. DUNDAS GRANT said it seemed to him that the tonsil on the right side was not so much enlarged as pushed inwards by the glandular mass ; he thought this might be a condition altogether independent of that of the tonsil.

Dr. DAN McKENZIE said he had had the same idea as Dr. Grant, that the tonsils did not look as if they were seriously diseased.

Dr. DAVIS replied that the tonsils had now cleared up very much, but they had been white with secretion. Since Mr. Tyrrell Gray advised him to give iodide of potassium and mercury they had cleared up. If it could be managed, he would take a portion of the gland away for examination, and he hoped to show the case again.

Skiagram showing a Butcher's Wire Skewer in the Right Secondary Bronchus of a Girl, aged 8.

By H. J. DAVIS, M.B.

THE skewer, $2\frac{1}{4}$ in. in length, was exhibited. It had been in the lung seven weeks, and owing to the point being upwards it was very
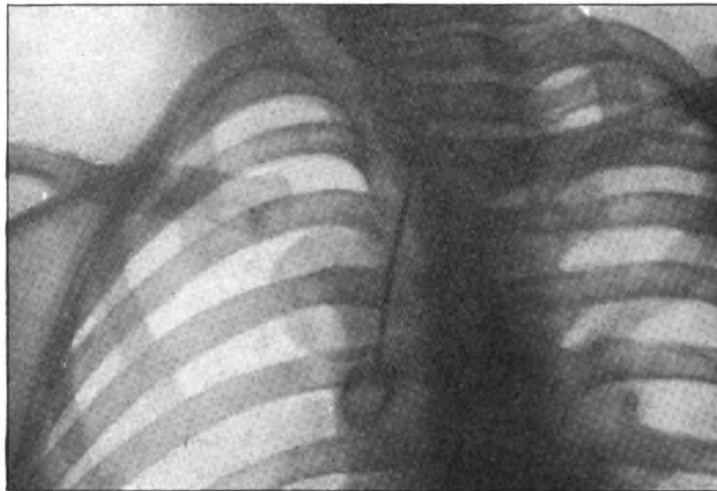
Wire skewer in the right secondary bronchus (skiagram by Dr. Morton).

difficult to extract. The child was very ill with broncho-pneumonia (unilateral), but rapidly recovered when the foreign body was removed and was now perfectly well.

DISCUSSION.

The PRESIDENT said Dr. Davis's patient reminded him of the well-known case reported by Dr. Brünings, in which a carpet nail was impacted head downwards in the bronchus, and was only removed after nine attempts at extraction. Dr. Brünings invented and described a special instrument **for**

dealing with this class of foreign body.   He suggested that sometimes it would be advantageous to use the X-rays at the time the surgeon was operating, so that he could be informed when the forceps were near the foreign body.   He had worked thus himself, and found the combined method a great help.

Dr. D. R. PATERSON called attention to a simple method of masking the point of a pin directed upwards.   When he had to remove a safety-pin which was open and had the point directed upwards, he passed a fine metallic tube over the point, and with that in position he caught hold of the safety-pin by the other limb and removed it.

Skiagram showing a Penny Coin impacted in the Œsophagus of a Woman, aged 25.

By H. J. DAVIS, M.B.

THE coin was exhibited, with two grape-skins, which were removed by œsophagoscopy, and were lying over the foreign body, obscuring its
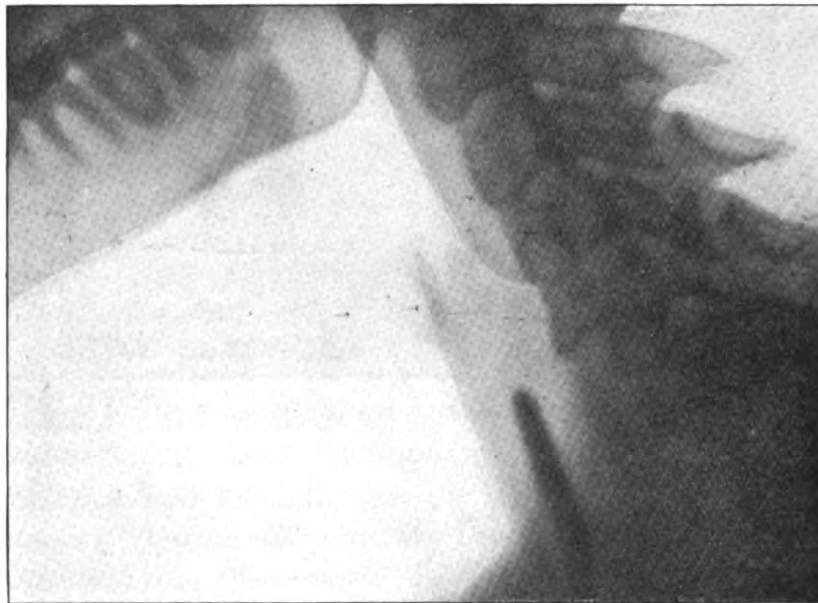
Penny coin impacted in the œsophagus (skiagram by Dr. Morton).

view.   The patient had been unable to swallow anything for four days. The coin was firmly held by the œsophagus and it was not easy to remove as the jaws of the forceps kept slipping off.

DISCUSSION.

The PRESIDENT said he had experienced how easily a coin might slip from smooth-edged forceps, and he thought the best way to remove such a body was with the old-fashioned coin-catcher, though it should be used under the guidance of the direct method.

Dr. IRWIN MOORE pointed out that the difficulty which Dr. Davis had experienced in this case in grasping and holding the coin with Brünings's forceps could be obviated by the use of the strong œsophageal forceps which he (Dr. Moore) had designed and introduced for removing foreign bodies with Brünings's tubes. With these forceps one could get such a firm grip of any foreign body, whatever its shape, that once seized it was next to impossible to lose hold of it. A child holding a coin grasped by these forceps could be pulled round a room without the forceps giving way or loosening their hold.

Sluder's Guillotine.

By H. J. DAVIS, M.B.

THIS pair of tonsil guillotines, the only two sizes made, were presented to me by Dr. Sluder, of St. Louis, U.S.A. The instrument is his own and well known, and is designed for enucleating tonsils, however large, or however small, whether buried or not. The method has been already described. The blades must be blunt, and as the tissue external to the capsule is difficult to cut through, Dr. Sluder has invented this " mechanics dog," which enables the blunt blade to crush through any resistance ; by the aid of the " dog " a piece of silk or wool can be easily severed. The instrument is very strong and takes to pieces easily and rapidly; it is made by Müller, of Chicago. I have used it several times, and it answers the purpose which the inventor claims admirably.

Dr. WATSON-WILLIAMS promised to show at a subsequent meeting a tonsillectomy instrument which he had devised some time ago, and which utilized the grasp of the hand instead of the weaker thumb, a principle that had been utilized by others. For tonsillotomy he had seen no instrument more ingeniously constructed than that now shown by Dr. Donelan.

Case of Pansinusitis.

By P. WATSON-WILLIAMS, M.D.

THIS was a case of pansinusitis, in which the double frontal sinus suppuration had been practically cured by intranasal operations, particularly removal of fronto-ethmoidal cells, followed by lavage, together with double intranasal radical antral operations, and partial removal of ethmoidal cells and opening up of sphenoidal sinuses.

The patient was a solicitor, aged 54, who, in 1907, had become very depressed, and carried on his profession with very grave difficulty. He had suffered from a red swollen purplish nose since boyhood, and the doughy, pitted, purple-veined nose was a distinct disfigurement. Sinusitis was probably determined originally by a septal deflection, but when the patient was first seen it had extended to all the accessory sinuses. He was to-day a quick, busy solicitor with a large practice in London, and had completely lost his depression and aprosexia. He was shown now, four years after the last operation was performed, to illustrate the advantages of *not* operating by radical external methods in cases where intranasal operation relieved symptoms and gave good drainage.

DISCUSSION.

The PRESIDENT said this was an illustration of the present-day practice of thoroughly draining the suppurating lower sinuses and curing the upper sinuses by irrigation and free drainage. This man was at work, and full of intelligence and alertness, whereas mental concentration was impossible before the suppuration in the sinuses had been cured.

Dr. WATSON-WILLIAMS replied that he wanted to emphasize his belief as to the possibility of getting extensive frontal sinus suppuration if not cured, at any rate ameliorated in a large proportion of the cases without any external operation, which latter he only performed when driven to it.

Infiltration of Uvula, Epiglottis and Arytænoids.

By C. W. M. HOPE, F.R.C.S.

F. M., MARRIED, aged 30, four children. Resident in Norway seven years. For the last twelve months noticed some hoarseness; also a gradual thickening of lips. Has had two seizures; one before and one after third pregnancy. Examination shows solid white swelling of uvula, spreading on to soft palate; same condition of left arytænoid; epiglottis, both ary-epiglottic folds, and slightly also of the right arytænoid. Cords are free. Palate is *not* anæsthetic.

[*Addendum.*—Since showing the case the Wassermann reaction has been done; it is positive, and 0'6 grm. of salvarsan has been given. A second dose will be given next week.]

DISCUSSION.

Dr. DUNDAS GRANT said the case presented some features suggestive of myxœdema, either general or limited. The patient said her face had now become fatter than before. The thyroid gland was scarcely perceptible. There was no ulceration, and it would be interesting to know if any further signs of hypothyroidism were present. In any case treatment by thyroid extract might be tried.

Mr. E. D. DAVIS said that two or three years ago he saw a case with much the same appearance (at the Bergen Lazarette), and in that case as well as in this the pharnyx was anæsthetic. There was some œdema of the epiglottis and the arytæno-epiglottidean fold, but the nose was normal. The patient came from Christiania. He thought that further investigation might prove it to be a case of leprosy.

Mr. HOPE replied that he also had thought of leprosy, but the case had not yet been fully gone into. The patient would be brought again later.

Case of Atrophic Rhinitis, showing several unusual Features.

By Cyril Horsford, F.R.C.S.

Patient, female, aged 21 (under the care of Dr. Abercrombie). Well-marked atrophic rhinitis on both sides, with enlarged middle turbinals which have fused together anteriorly through a large perforation in the cartilaginous portion of the septum. Trouble with nose dates from childhood. Both antra dark on transillumination, but when washed out are found to be empty. Some evidence of congenital syphilis observed in rhagades on upper lip. Complete occlusion of right auditory meatus with formation of adventitious drum. Early stage of similar condition in left ear—namely, chronic suppurative otitis media and narrowing of left auditory meatus.

The President said that perforation in itself did not suggest syphilis; it might be caused by trophic changes, such as one frequently saw in the so-called " idiopathic " perforations.

Laryngological Section.

December 6, 1912.

Mr. HERBERT TILLEY, President of the Section, in the Chair.

A Belated Sequel to a Successful Operation.

By HERBERT TILLEY, F.R.C.S.

INCREASING difficulty of breathing and stridor caused by inflammation of the larynx, set up by suppuration around a necrosed portion of the cricoid cartilage. Fifteen years previously the patient had been successfully operated upon by Sir Felix Semon for epithelioma involving the anterior region of both vocal cords.

Admiral C., aged 73, consulted me some two months ago for increasing difficulty in breathing and some pain on swallowing. The stridor was well marked, especially after exertion or coughing. Laryngoscopy revealed a very narrow glottic aperture surrounded by intensely congested cicatricial tissue. Pressure over front of larynx produced some pain. Below the right edge of the glottis a pale granulation could be seen.

On November 20 I opened the trachea and inserted a tube, and then split the larynx to ascertain the cause of the stridor. A very fetid slough was seen on the inner aspect of the cricoid, and on curetting it the piece of necrosed cartilage (exhibited) was removed. Recovery has been rapid and uneventful.

The exhibitor believes that such a sequel is unique, and reports the case to emphasize that complications following thyrotomy from malignant disease are not necessarily due to recurrence of the original malady.

ERRATUM.—Mr. Muecke's case shown at the last meeting, see *Proceedings* (December, 1912, vi, No. 2), p. 13. The title of this case was, in error, stated as " Double Abductor Spasm, caused by Vocal Overstrain (?)," whilst in the discussion Sir Felix Semon has been made to say that spasm had been present " due to over-action on the part of the abductors." The title of the communication should have been : " *Double Adductor Spasm due to Over-strain (?),*" whilst Sir Felix Semon in reality spoke of spasm " on the part of the *adductors.*" —EDITOR.

DISCUSSION.

Sir FELIX SEMON said there was nothing special about the original malady of the patient, who was then aged 58, and had malignant disease on the anterior parts of both vocal cords. He performed thyrotomy and curetted the parts, and there was an uneventful recovery. The sequel to the thyrotomy performed fifteen years previously, in his experience, certainly was unique. One knew that sometimes a sequestrum, or foreign body, might remain impacted for many years without causing trouble, and then suddenly, without obvious reason, might assume activity, migrate from its original site, and cause trouble elsewhere. The case taught that, even at very late periods, every swelling within the larynx after such operations did not necessarily represent a recurrence of the original disease. With regard to early after-events, a fact to which he had repeatedly drawn attention, and which now met with general notice, was that, if in the scar of a thyrotomy wound a new little tumour made its appearance, one should not at once rush to the conclusion that it must be a recurrence of the original disease. On the contrary, it would be almost universally found that it was only a granulomatous tumour, and if that tumour were removed by forceps from within, it disappeared entirely. It might reappear, but after another removal there was hardly ever a further recurrence. The seat of such granulomatous tumour was either in the scar itself of the former growth, or the anterior commissure of the vocal cords, due to the suture of the thyroid cartilage after the operation. He hoped as much publicity as possible would be given to the case, as it might spare many a patient an unnecessary repetition of the operation.

Dr. DUNDAS GRANT said he had had a similar experience to that which Sir Felix Semon described, and it was disconcerting unless one bore in mind that it was not unusual for granulations to form on the re-entrant angles of the thyroid, and speedily disappear under the applications of chloride of zinc. The illustrations to the paper which Sir Felix Semon brought before the International Congress at Budapest showed the condition very well.

The PRESIDENT (Mr. Herbert Tilley), in reply, said that that very morning he had performed thyrotomy for malignant disease, and when his assistant asked whether he would not put in a stitch to fix the sides of thyroid cartilage, he replied that he preferred a small stitch outside and over the front of the thyroid cartilage. In his earlier experiences of the operation he had had anxiety on account of the granulations which formed round the stitch when this passed through the cartilage of the thyroid, and had been disappointed when the patient came back at the end of two or three months with a papillomatous mass in the anterior commissure, which he feared might be a recurrence. This occurred in the patient whose larynx he showed before the Section[1] three years ago, and who lived thirteen years after the primary operation, and then died with a recurrence, or a new growth on the opposite vocal

[1] *Proceedings*, 1910, iii, p. 33.

cord. Therefore he now preferred to stitch the perichondrium and the soft tissues at the sides of the thyroid cartilage and draw them just tight enough to keep the thyroid cartilages fixed for a few days until they were secured by the natural inflammatory exudation.

Very Large Tonsil in an Elderly Patient reduced almost to Complete Disappearance by Galvano-puncture.

By HERBERT TILLEY, F.R.C.S.

THE Rev. E. S. D., aged 68, consulted me on March 26 last for " an accumulation of matter in the nose," which he felt he could not get rid of ; " increasing deafness in the left ear for past few weeks," and alteration in the voice as if he " had a quinsy." These symptoms had· developed during the past six months previous to his visit to me. The left tonsil was so swollen that it almost touched the right fauces, and extended downwards beyond direct vision below the level of the epiglottis. It was not inflamed nor ulcerated. No enlarged cervical glands. I punctured it deeply in three places with the galvano-cautery. Three weeks later an extraordinary reduction in size was noticed. Similar treatment has been applied on three or four occasions since then, and, with the exception of the lower pole of the tonsil, the gland has almost entirely disappeared. The marked deafness in the left ear has also almost vanished, so that it is now his better ear. The galvano-cautery appeared to initiate a rapid absorptive effect on the tonsil, rather actually to destroy its tissue and replace it by a smaller fibrous mass.

DISCUSSION.

Mr. TILLEY said that in these days, when no enlarged tonsil seemed safe from surgical interference, he thought it was well to exhibit a type of case in which it was possible to obtain almost total abolition of the symptoms by measures simpler than radical surgical procedures. He at first thought the patient might have some form of new growth in the tonsil. As he was elderly, the question of enucleation was postponed as long as possible. He had not cauterized the tonsil through its lowest pole. The patient was now quite comfortable, his hearing was better, and unless there was urgent reason for more to be done, he proposed to rest content. A fortnight after making the first three punctures that part of the tonsil which had been cauterized had almost entirely disappeared.

Dr. DE HAVILLAND HALL said he had occasionally used the galvano-cautery for enlarged tonsils. He mentioned, in one case particularly, that

of a fat, flabby lady, aged 40, the anæmic type of patient who looked bluish. She had huge tonsils, which were a serious inconvenience to her. The treatment occupied six weeks, and resulted in great diminution in the size of the tonsils. He lost sight of her for a year, then she reappeared and had another course. Five years later she presented herself for inspection, and there was no vestige of tonsil visible. It was for patients who were getting on in years, and in whom there was a liability to serious hæmorrhage, that the cautery was a great advantage.

Dr. KELSON said that, supposing the swelling was solid, not cystic, the case was of great interest, as it illustrated something in physiology which was often overlooked—namely, the power possessed by the galvano-cautery to cause absorption. In hypertrophic rhinitis, when the galvano-cautery was applied, a great deal more room was often produced than could be expected from either the slough separating, or from cicatricial contraction.

Dr. WATSON-WILLIAMS pointed out that both enlarged tonsils and adenoid growths were examples of lymphoid hypertrophy in response to infection: the rapidity of such infective hypertrophy was exemplified by tonsils in acute conditions undergoing marked enlargement. The benefit of the cautery was probably due largely to its action on the invading micro-organisms: (a) directly, when it was probably much the same as the ancient form of applying burning irons to wounds as an antiseptic; and (b) from the indirect effect of the inflammatory reaction set up. He took it that the condition in the patient shown was a subacute one, in a not very fibrous tonsil. In patients in whom the more rapid method of the usual operation was contra-indicated cauterizing was very efficient.

Dr. FITZGERALD POWELL said that no doubt most of the members had treated enlargement of the tonsils with the galvano-cautery — usually, he thought, with the surface cautery. It was a tedious, painful process, and required a number of sittings. In this case galvano-puncture had been used with great success, and it was a very useful method of treatment where, for various reasons, operations for tonsillotomy were not desirable.

Dr. PEGLER said the operation was not very uncommon ten or twelve years ago, and he believed that the reason it was given up was because of the pain it occasioned. He asked whether this patient complained much from that cause. It would be interesting to see whether, after this, reduction by the galvano-cautery became the rage like enucleation as a routine treatment.

Dr. DUNDAS GRANT said the matter was a most interesting one, and it would be instructive to learn what was the exact appearance of the tonsil— for instance, the relation of the hypertrophied portion to the lacunæ; also, whether it looked fibrous, or soft, and whether there was any other treatment. He presumed the cautery was pushed deeply into the tonsil, away from the mouths of the lacunæ, because one objection to the cautery here was its tendency to seal up the mouths of these tubes. Years ago he had been

deterred from using the cautery because neurasthenic people who had been submitted to cauterization of the tonsils at other hands had afterwards neuralgic pain at the site, and this persisted for a considerable time.

Sir FELIX SEMON said he was listening to the debate with some amusement, because in their speciality many things seemed to occur in cycles. Formerly it was a sort of universally accepted, if unwritten, rule, that in cases in which the tonsillotome was not well applicable, as in cases of adults, or when considerable hæmorrhage might be expected, the galvano-caustic method was the one to be selected. After it had been used—and he was afraid he must say, much abused—in many cases, as for some time it was in the nose, it all of a sudden fell into entire desuetude. Now the President had revived it. If he were still in practice, he would still use the galvano-cautery for suitable cases of enlarged tonsils, particularly in adults with hard tonsils, which it was necessary to reduce, and in whom the tonsillotome was not to be recommended. The pain of the operation itself was minimal, after previous cocainization, and if afterwards orthoform or anæsthesin was insufflated, the after-pain was much reduced, even in neurasthenic patients.

Dr. IRWIN MOORE said that formerly he had often used the method of galvano-puncture, and was satisfied with the result. He did not think he had had one case of pain or inflammatory reaction. The patient could be cocainized in the consulting room, and come once a week for five or six weeks. He had used it for children from 8 years of age upwards, and it was quite satisfactory if their confidence was gained by the operator and they would sit quiet.

Dr. DAN MCKENZIE said that notwithstanding the furore raging around the tonsillotome, no one had been heard to recommend it in such a case as this, showing that there was a class of case in which the galvano-cautery was the proper treatment for the reduction of tonsils.

The PRESIDENT, in reply, said, that the galvano-puncture caused practically no pain, and the patient seemed willing for him to make as many punctures as he wished, but on no occasion did he make more than three. The tissue was glandular, soft, and not inflamed. He would not have used the cautery if the tonsil had not been fibrous, because it might have caused the locking up of septic accumulations, which would have produced localized areas of inflammation. No iodides or arsenic were given, but after the third sitting— i.e., after great diminution had already taken place—he gave the patient some arsenic and nux vomica. The tonsils were first painted with 15 per cent. cocaine, and he then used a fine long cautery point and passed it deeply into the middle of the most prominent portions of the tonsil. Presumably the cauterized regions were not very absorptive, and he supposed the cautery set up acute defensive inflammation, with such leucocytic exudation around the cautery track that micro-organisms found a difficulty in entering.

Ulcerating Growth of Left Vocal Cord, probably Epithelioma.

By Herbert Tilley, F.R.C.S.

Patient, male, aged 42, applied to hospital for hoarseness of twelve months' duration. He has always been healthy and there is no history of any constitutional disease. The left ventricular band and cord are replaced by an uneven, granular swelling. There is some movement of the cord and the arytænoid moves freely. Wassermann test negative. No physical signs of tubercle in the lungs.[1]

Extensive Syphilitic Necrosis of Bones in Relation to the Nasal Cavities.

By C. W. M. Hope, F.R.C.S.

M. C., female, aged 47, attended King's College Hospital for the first time in September, 1911, complaining of nasal discharge and slight ozæna.

Past history : Injury to nose twenty years ago. Had seven children ; four alive and healthy at present time; three died at ages of 3, 5, and 9 years, of scarlet fever, measles, and rheumatic fever.

Diagnosis of gummatous rhinitis made, and patient put on a mixture of potassium iodide 5 gr. (increasing to 15 gr.) and inunctions of ung. hydrarg. ; coll. alk. sacch. used as a nasal lotion.

By November 7, 1911, septum had necrosed away. Patient continued treatment regularly until December, 1911.

June 14, 1912 : Six months later returned with shocking ozæna, very marked nasal depression, and nose filled with pus, crusts, and sequestra. Several sequestra were removed by means of Luc's forceps and a Sanitas nasal lotion ordered.

June 21 : More sequestra removed. Wassermann reaction found strongly positive ; nose still very foul smelling. On cleaning out nose, both nasal bones were found absent, both maxillary antra almost completely laid open into the nose, and a tooth found protruding into the floor and removed by the nasal route (right lateral incisor).

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[1] January 9, 1913 : This patient has been operated upon ; the growth was a squamous-celled epithelioma.—H. T.

On July 6, 1912, 0.55 grm. of salvarsan was given intravenously, and again on July 12, 1912, by Dr. Emery. The nose at once began to clean up, ozæna rapidly disappeared, and the nose now is clean and sweet, and patient has put on weight and lost the marked anæmia present on June 14, 1912. The sequestra proved to be the two nasal bones, nasal processes of superior maxillæ, and anterior halves of palatal processes of same bones. There is no perforation of the hard palate in front.

DISCUSSION.

Dr. DUNDAS GRANT said he brought before the Laryngological Society a similar case in which no improvement took place until injections of calomel were given into the muscle, the patient being at the same time highly fed with cream and stout. She went on very well, but a year later she died of nephritis. If he were to have a similar case now, he would use salvarsan, but would afterwards use mercury, as seemed to be thought necessary by authorities.

Mr. PARKER said he had a man under treatment for tertiary syphilis, whose nose at first was packed with offensive crusts. After the first injection of salvarsan these crusts had disappeared, and there had been no recurrence of either crusts or stench, in spite of the Wassermann test remaining markedly positive after four injections.

Mr. WESTMACOTT spoke of a case in which the crusts and sequestra were removed on successive visits, but after the patient had been on 20 gr. of potassium iodide three times a day, they cleared up in a remarkable way. No mercury or other form of treatment was given. He recently had a case in which necrosis of the ethmoid region had broken through the wall into the orbit, and produced some proptosis. The Wassermann test was positive. Here again, he had removed two or three large sequestra, and 20 gr. of potassium iodide had given great benefit. As regards the eye, the proptosis had disappeared. He regarded it as essential to give at least 20 to 30 gr. thrice daily—smaller doses did not seem to give any relief.

Dr. PEGLER noted that the report stated the nose to be sweet and clean, but he found that purulent material was pouring out of the right antrum, and the left one was far from clean; unless these cavities were carefully washed out, the nose would be liable to reinfection.

Mr. HOPE, in reply, said that Wassermann's test had not been done a second time. He admitted there were now some granulations present, but they were not there when he wrote the notes. The patient had used gauze packing a few times, but she had given it up.

A Case of Branchial Fistula.

By G. H. L. WHALE, F.R.C.S.

J. D., MALE, aged 29. There is a small sinus over the right ala of the thyroid cartilage. A small probe passes upwards ⅛ in. only. The sinus weeps during and after meals. But the collected discharge is much too viscid for saliva; moreover, it retains its alkalinity indefinitely, and does not convert starch into sugar. This is therefore presumably a blind external branchial fistula, although the opening is not quite in the usual place.

Indication for treatment : The discharge soils his collars and the sinus-mouth occasionally suppurates.

DISCUSSION.

Dr. DUNDAS GRANT regarded it as an aberrant thyro-lingual duct, although the opening was at some distance from the normal position ; with the fingers he could trace it to the hyoid bone. A careful operation might get it well. A fine probe must be passed up until it got to the hyoid bone, and it should be uncovered as far as possible by dissection, and through the tube a fine electric needle (electrolytic or galvano-caustic) could be passed. In two cases in which he did this there was no recurrence.

Dr. FITZGERALD POWELL was of opinion that this was a sinus remaining from a cyst in connexion with a branchial cleft which had been opened in early youth. At the bottom of the sinus would be found a distended portion, from which secretion arose. He had dissected these out, and found no great difficulty in doing so. He could not agree that it was a sinus in connexion with the thyro-lingual duct ; it was well away from the middle line.

Mr. WILKINSON did not see why it should not be a branchial fistula derived from the fourth branchial cleft. The inner opening of such a cleft would be situated in the pyriform fossa. An operation for dissecting it out might prove a serious undertaking, owing to the close relations of the sinus with the sheath of the carotid and other important structures in the neck.

The PRESIDENT considered it to be a branchial cleft. In a family of eight whom he knew, four had these branchial clefts and one had auricular appendages. They were mentioned in a paper on the subject which Mr. Howell Evans had published.[1] The chief inconvenience was the soiling of the collar which occurred. An extensive dissection was often necessary for the cure of these clefts, for sometimes they went deeply towards the side of the pharynx and the base of the tongue.

[1] *Proceedings*, 1909, ii (Discussion on Heredity and Disease), pp. 98-105.

Aberrant Thyroid Tumour from the Base of the Tongue.

By W. G. HOWARTH, F.R.C.S.

THE patient complained of great difficulty in swallowing with occasional attacks of dyspnœa. The tumour involved the base of the tongue in the middle line, and was pressing against the lingual surface of the epiglottis. There had never been any symptoms of thyroid insufficiency. The thyroid in the neck was scarcely palpable, but at the time of operation, when a preliminary laryngotomy was performed, both lateral lobes were found to be present, though no trace of the isthmus could be detected. The section shows a fibrous capsule outside a layer of thyroid glandular tissue; the centre of the tumour is made up of blood-clot.

Fibroma from the Soft Palate.

By W. G. HOWARTH, F.R.C.S.

THIS occurred in a patient who had a papilloma of the uvula removed six months ago. The section shows fibrous tissue in every stage of development.

DISCUSSION.

Mr. HOWARTH said that six months ago he had removed a papilloma from the uvula and put in a catgut stitch. It had been suggested to him that the present tumour had been caused by the irritation of the stitch, and he would be glad to hear the experience of others.

The PRESIDENT remarked that at one of the meetings of the old Laryngological Society a member remarked that tumours of the soft palate were very rare; but during succeeding meetings of the Society several cases were shown. Mr. Stephen Paget showed a case of fibroma of the soft palate, and other members also exhibited cases of non-malignant tumours of the soft palate.

Healed Lupus of the Pharynx and Larynx.

By W. G. HOWARTH, F.R.C.S.

THIS case was shown in March, 1912.[1] The condition was then extremely active, the pharynx and larynx being ulcerated and swollen.

DISCUSSION.

Mr. HOWARTH said, in regard to this case, that nothing in the way of local treatment had been used. It was well known that such cases had a tendency to heal spontaneously. He had taken care that the patient was in the best hygienic conditions, and he gave her cod-liver oil and milk, but no local treatment and no drug.

Dr. FITZGERALD POWELL asked if arsenic had been given. He had had under care a girl whose larynx, pharynx and nose were in a similar condition, and had cleared up completely under arsenic. He would like to know if the members had found benefit from arsenic in similar cases—or was the cure due to cleanliness and improved hygenic conditions?

Mr. LOGAN TURNER asked if members had had experience in connexion with the treatment of lupus by Pfannenstill's method—namely, using nascent iodine and ozone or hydrogen peroxide. He had treated several cases in that way, and was so far pleased with the results. The patient was put upon sodium iodide, and pledgets of sterilized gauze soaked in hydrogen peroxide were placed in the nasal cavities. Cases which had been treated by curetting and scraping without success responded very well to this method. He was applying it in a case very much like the one shown, with pharyngeal and laryngeal lupus.

Mr. HUNTER TOD said that with regard to the treatment of lupus of the nose, the method of plugging the nose with hydrogen peroxide solution, to-gether with internal administration of iodides, as described by Mr. Turner, had been used in the London Hospital for some time, but the results had not been very successful. No doubt it had been beneficial in some of the mild cases, but the chief difficulty was to make the patients continue with the treatment as it was so disagreeable. With regard to curetting the nose, whatever might be the opinion of others, he himself was certain that it was by far the best treatment. At the London Hospital, owing to there being a Lupus Department, he had the opportunity of seeing and treating a very large number of cases. It was interesting to note that those in charge of the Lupus Department refused to treat cases of lupus of the face unless the nose had been examined, because

[1] *Proceedings*, 1912, v, p. 118.

it was found that, although there might be no external signs pointing to lupus within the nose, it frequently existed, and that until the lupus within the nose had been removed by curetting, and although a temporary cure might be obtained of lupus of the face by the Finsen light treatment, a recurrence usually took place. On the other hand, if the nose was thoroughly curetted, not only was a more rapid and better result obtained by the light treatment, but it was usually permanent. Mr. Tod's method of curetting the nose was by means of the ring knife. He did not claim immediate cure, but if recurrence took place, the part could again be curetted under the local anæsthetic of cocaine. The very emphatic opinion of those in charge of the Lupus Department at the London Hospital was that, although arsenic might be beneficial, and might improve the condition of health, its use, or applications of lactic acid, carbolic acid, the cautery, and other out-of-date methods of treatment were of no value. They pinned their faith absolutely to free curetting, and this had been definitely proved by the results.

Sir STCLAIR THOMSON thought sufficient stress had not been laid on the fact that this particular case had got quite well without any local or general treatment. He had emphasized this point at more than one of the meetings. A drawing of one such case was given in his book—a very extensive case of lupus in the larynx in a girl who had nothing done to the larynx, and whose lesion had remained cicatrized for eight years. This case might be compared with the case shown by Mr. Hastings (*see* p. 54), but the latter was a typical tuberculous ulceration. Though both had the bacillus of Koch as a basis, the lesions were very different. In view of what he had said, one should be very modest in ascribing successes with lupus to any particular treatment, and under those treatments he included arsenic; he had made a careful trial of arsenic, but it had proved a failure, though a few cases improved under it. Many cases of lupus which got well broke down again.

Dr. D. R. PATERSON said that in two cases he tried the method mentioned by Mr. Logan Turner, and had good results. The patients had had various kinds of treatment before, including repeated scrapings and the administration of arsenic, cod-liver oil and iodopin. He took the patients into hospital as it was difficult to get constant supervision at home. He kept the gauze constantly soaked with the peroxide of hydrogen, and gave sodium iodide internally. He treated one of the cases months ago, and six months later there was no recurrence.

Dr. DAN MCKENZIE said his experience had not been so favourable as that of Dr. Paterson. The process was very tedious and difficult to apply, it made the patient uncomfortable, and it was necessary for the application of the peroxide to be constant, so as to get the full effect of the nascent iodine. In the cases in which he had applied it, the patients had been very persistent and conscientious, yet the results after the first few weeks were not good, the condition seemed to slip back, so that the net result of the treatment was practically *nil*.

Dr. H. J. DAVIS said he had had an unfortunate experience with hydrogen peroxide. Two years ago a colleague sent him a patient, with the request to curette the palate, where she had undoubted lupus as well as in the nose. He told her to do nothing for a fortnight, and see him again at the end of that time. It had improved very much. He then ordered her applications of peroxide of hydrogen. The result was unfortunate, for the palate gave way and caused her considerable suffering. He left it alone for a time, and the palate healed. Later she used it again with the same result—the strength of the peroxide was 10 vols. The palate healed perfectly with lactic acid and orthoform applications, and he believed the patient had remained well ever since. The palate was not curetted.

Mr. HOWARTH, in reply, said that he did not give the patient any arsenic. He had not had any experience with Pfannenstill's method.

Kuhn's Per-oral Intubation Apparatus.

By W. G. HOWARTH, F.R.C.S.

THIS apparatus is very useful for operations at the back of the throat or nose where bleeding is very severe, as by its use the necessity for a preliminary laryngotomy is obviated.

DISCUSSION.

Mr. HOWARTH said he had used the instrument for eighteen months with considerable satisfaction. In many cases he did not now do preliminary laryngotomy, but used these tubes. He did so in the palate case he showed that day, and in such cases as sarcomata of the tonsil and post-nasal space. He was surprised that the apparatus was not better known in England, as it had been used very largely on the Continent for several years.

The PRESIDENT asked if Mr. Howarth did not find that blood sometimes passed beyond the vocal cords into the trachea, for he had heard it stated that the instrument did not completely occlude the glottis.

Sir FELIX SEMON said he had seen the tubes repeatedly used in Professor Killian's clinic in cases of operations on the upper air passages, and there had been no escape of blood into the lower air passages, even when there was much bleeding at the time of the operation. The method seemed an excellent one.

• A Small Swelling in the Post-nasal Space.

By G. W. BADGEROW, F.R.C.S.Ed.

THE patient, a male, aged 25, came to the Throat Hospital, Golden Square, complaining of deafness, duration six years. He is unable to hear the watch on contact to the left ear. On examination of the post-nasal space, a small rounded swelling is noticed ; it is soft and fluctuating to the feel. The patient has no difficulty in breathing, nor is the voice altered. On raising the palate the swelling is made to protrude. The patient has not had an operation for removal of adenoids.[1]

DISCUSSION.

Mr. BADGEROW added that he had not seen a similar case. It might be a mucous cyst or a retention cyst of the adenoids.

Dr. BROWN KELLY said he considered that the condition was due to a cyst. The references in text-books to this affection were very meagre, but a good description of it might be found in Tornwaldt's "Bursa Pharyngea."

Meningocele in the Nasopharynx.

By H. A. KISCH, F.R.C.S.

THE infant, 6 months old, was brought to the hospital on account of difficulty in breathing through the nose. There is a cystic tumour in the nasopharynx, pushing forward the soft palate. The tumour is situated in the mid-line, and becomes tense when the child cries. It is apparently attached to the anterior surface of the spine. There is no evidence of nerve involvement, or other abnormality. An X-ray photograph has been taken.

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[1] I have since operated on the above case and found the swelling to be a cold abscess in connexion with the vertebræ, with erosion of the bone.—G. W. B.

The Fin of a Haddock extracted from the Œsophagus.

By C. W. M. HOPE, F.R.C.S.

(Shown by Dr. H. J. DAVIS.)

THE fin of the haddock was removed from the patient by the direct method. Ten days after its lodgment the position occupied by it was 4 in. below the cricoid. It had given no inconvenience beyond slight difficulty in swallowing solids.

A Chicken Bone 1¼ in. long removed from the Upper Part of the Œsophagus.

By D. R. PATERSON, M.D.

THIS was taken from a young Chinaman, who presented himself at the hospital with almost complete œsophageal obstruction and pains in the upper part of the gullet of forty-eight hours' duration, which had come on after eating some chicken. A medical man had cautiously passed a bougie, and having ascertained the presence of an obstruction, had wisely refrained from any further attempt. With the œsophageal tube the upper end of the bone was exposed just below the cricoid orifice. Grasping it with the forceps, its lower end appeared to be fixed in the œsophageal wall. It was easily removed. Both its ends are sharp. The specimen is shown to illustrate (1) the danger of attempting to push down such a body with a bougie; (2) the advantage of using a straight-ended tube for work in the upper section of the gullet.

DISCUSSION.

Dr. BROWN KELLY said that for removal of sharp foreign bodies impacted in the upper part of the œsophagus he recommended Killian's or Hill's dilatation speculum, preferably the latter. One branch could be placed in front and the other behind the foreign body, which usually lay with its long diameter transversely.

The PRESIDENT referred to a case which had come under his care about three weeks previously in which a halfpenny had been lodged just below the cricoid region of the gullet for five days. On direct examination the coin was seen lying in an ulcerated area and surrounded by œdematous granula-

tions. It was removed with little difficulty, but the child died the same night from collapse. At the post-mortem examination the œsophagus was found to be ulcerated right through into the trachea and that had occurred in five days. Possibly the coin was septic before it entered the throat.

Dr. DAN McKENZIE said it was nowadays fairly common to hear of foreign bodies removed from the air passages, and one wondered what happened to those cases before the introduction of long tubes. Did the patients invariably die or become the victims of serious disease? There must be some foreign bodies which caused but a trivial disturbance, otherwise more fatal cases would have been heard of.

The PRESIDENT remarked that possibly many of the unsuspected cases of foreign bodies had suffered from bronchiectasis and were regarded as such. In one case of bronchiectasis which had been referred to him, the foreign body had been retained for three and a half years. Possibly some hitherto obscure cases of septic pneumonia were due to impacted foreign bodies.

Dr. PATERSON, in reply, remarked on the ease with which the laryngeal region could be examined in Chinamen, who required but little cocaine. In this case the Chinaman stood examination well, and the removal was extremely easy to carry out.

Telescopic Œsophageal Tube with the Outer Tube Straight-ended and the Inner Tube Beaked.

By D. R. PATERSON, M.D.

. THE exhibitor has constantly used this tube for the last three years. A disadvantage of the ordinary bevel-ended outer tube is that when working in the upper part of the œsophagus its point travels in front of the line of vision and, further, exposes only one side of the canal to view. On the other hand, a straight-ended tube, as it passes down, opens out the whole circumference of the œsophageal wall simultaneously. The instrument shown has a bevel-ended inner tube which, acting as a pilot, is easy of introduction. Once past the cricoid opening it is withdrawn, leaving the straight-ended outer tube to continue the examination. The latter, being wider, gives, moreover, greater room for manipulative measures.

Dr. DUNDAS GRANT said the tube was an obvious improvement. It acted like a mandrin, but permitted of inspection during its progress. The wonder was that it had not been thought of before. Those who had had difficulty in passing a straight-ended tube past the cricoid cartilage must have wished for some such instrument.

A Case of Hyperostosis Cranii.

By Edward D. Davis, F.R.C.S.

The patient complained of deafness of gradual onset. The swelling of the right cheek was noticed about twenty years ago, and eighteen years ago (1894) Sir Watson Cheyne removed an osteoma from the infra-orbital margin and the facial wall of the antrum. The denture now worn was made eleven years ago, and the fact that the plate is $\frac{1}{4}$ in. from the teeth gives a rough estimate of the rate of growth of the palatal swelling. No family history.

Present condition : A woman, aged 43, with an osseous and uniform swelling of the palatal process and facial surface of the right maxilla or the mastoid process. The nose is normal. Both antra are opaque to transillumination. The right external auditory meatus shows exostoses. The Eustachian tubes are obstructed. Skiagrams are shown with the case. No other exostoses can be found. Wassermann reaction negative.

DISCUSSION.

Mr. Wilkinson said there was a form of very slow growing osteo-sarcoma of the antrum. The antrum became filled with porous bone, in which the cell elements were scanty. Some cases of the kind had been reported in America. He had had one such tumour in a young female child, in which he removed the upper jaw. There had been no recurrence, but he had rather regretted having done so extensive an operation, attended as it was by serious deformity, where a less radical procedure might have sufficed.

Dr. Pegler remarked that this case had not received the more familiar title of leontiasis ossium. He hoped to show the Section the skiagrams (if not the case itself) of an example limited to the parietal and upper mastoid region in an elderly lady, one side being chiefly affected, and deafness being associated with that side. It was a true hyperostosis cranii, and such a term as leontiasis was scarcely applicable to it.

Bullet Injury to the Larynx.

By H. J. Davis, M.B.

The patient, a man, aged 22, was shot through the larynx. The bullet, a Mauser, passed out on the left side of the neck. There is now a swelling of the thyroid gland and the patient has palpitation. The view of the interior of the larynx is interesting. The vocal cords were

evidently shot away, for on taking a deep inspiration the aperture of the glottis is circular, the apex of the anterior attachment of the true cords being replaced by a band of fibrous tissue which stretches on deep respiration like a piece of elastic.

DISCUSSION.

The PRESIDENT remarked that it was an excellent illustration of the extensive traumatism which many of our soldiers suffered from in the South African War, and had yet come through without permanent and total disablement.

Dr. DAVIS, in reply, said he wondered what was the cause of the induration of the thyroid gland. X-rays revealed nothing. The patient was originally admitted under Dr. Saunders on account of palpitation, and was referred to him (Dr. Davis) to ascertain whether he had paralysis of the left vocal cord. There was no cord paralysis, as there were no cords. The patient phonated with the ventricular bands.

Paresis of the Left Recurrent Laryngeal Nerve in a Woman, aged 35.

By H. J. DAVIS, M.B.

THE patient, a Russian, has an enlarged thyroid gland of which she complains. The voice is unaffected, although the left recurrent laryngeal is partially paralysed. Left abductor paresis.

Mr. NORMAN PATTERSON said he saw the case some time ago at Golden Square Hospital, but did not notice any paresis of the left cord. Now there might be slight abductor paresis of both cords, not specially associated with the left.

Papilloma of the Nose in a Man, aged 40.

By H. J. DAVIS, M.B.

THE entire left nasal cavity was occluded by a papillomatous growth; it was sprouting from septum, vestibule, and inferior meatus. The exhibitor assumed it was malignant, owing, among other things, to its vascularity—but this is not so. Several sections are reported to be " non-malignant papilloma " (by Dr. Elworthy). The growth was curetted—it has not recurred, but, as can be seen, is not completely removed ; on the left side of the cavity a few elevations still remain in situ.

Microscopical section of growth also exhibited.

JA—10

A Spicule of Rabbit Bone, ¾ in. in Length, removed by Upper Bronchoscopy from the Trachea of a Boy, aged 5.

By H. J. DAVIS, M.B.

THE child, while eating boiled rabbit, had a choking fit lasting a quarter of an hour; it then stopped. The mother, who had pushed her finger down the boy's throat, thought that he had swallowed the obstructing body, but " as he had been unable to swallow anything since " —i.e., for twenty-four hours—she brought him to the hospital to see whether she was right in her surmise or not.

The child, I noticed, kept his head bent to the left with the chin flexed on the chest. This was put down " to shyness," but I put it down to the foreign body. An X-ray plate was taken with negative results. Nevertheless the bone was there all the same, and was easily seen with the bronchoscope owing to its ivory colour; it was fixed obliquely in the trachea about 2 in. below the cords, and was removed with the extractor under anæsthesia.

This case was anæsthetized by Dr. Phillips by injecting a syringeful of ether into the buttock, the child being primarily rendered unconscious by ethyl chloride. This method is a great convenience, for it disposes of the wafts of chloroform which the operator periodically receives in his face when inspecting through the tube. Anæsthesia was complete, and I can recommend the method to others.

The case is also of interest as it exemplifies the fact that absence of cough and other respiratory distress by no means excludes, as one would expect it should, the presence of a foreign body in the air passages. The symptoms in such cases are very severe at first, and then quickly disappear, as in this instance, and nothing may attract attention for some days until perhaps a unilateral bronchitis develops— whereas, when foreign bodies lodge and are retained in the œsophagus, patients are in trouble all the time.

The foreign body is ¾ in. in length, very sharp at both ends, hence its impaction.

DISCUSSION.

The PRESIDENT said the negative result of the X-ray examination was very interesting. Sometimes one could detect the foreign body by instantaneous X-ray photography which would not have been shown by the ordinary method. He remembered a case in which a foreign body was thus overlooked (a very hard and thick chicken bone), but it was at once detected by the instantaneous method.

Dr. FINZI asked if a lateral view was taken in the case. Both lateral and anterior views should be taken. The instantaneous method should always be carried out in the case of children, otherwise there could not be a cessation of both breathing and swallowing during the exposure.

Dr. DAVIS, in reply, said that a lateral view was also taken. The child was quickly anæsthetized by ethyl chloride, and the injection was made not under the skin, but into the muscle of the buttock, which prevented sloughing of the skin. The liquid boiled at 90° F. The child was heavily asleep three-quarters of an hour after the operation. It was well known that injections direct into the muscle were not nearly so painful as those under the skin.

Photographs, untouched Prints, of a Young Woman after the Exhibitor's Double Radical Frontal Sinus Operation.

By P. WATSON-WILLIAMS, M.D.

THE patient had suffered for a long period from very severe supra-orbital headaches and pain at the back of the eyes, which prevented her

Reproduced from untouched photograph of patient after Dr. Watson-Williams's double radical frontal sinus operation.

following her occupation. She had double frontal sinus and double antral suppuration, and an operation on the antra and intranasal removal of suppurative ethmoidal cells failed to effect relief. The exhibitor's osteoplastic operation was performed a little more than a

JA—10a

year ago. The frontal sinuses were very large and deep for a female, and though completely cured of all headaches, there was a slight central depression in the forehead. She did not complain of the cosmetic defect, but as the left antrum required further attention, the depression was removed by paraffin injection. She is now not only completely cured, but there is practically no trace of the operation, which has left no cosmetic alteration, and certainly no defect.

Case of Sarcoma of the Upper Jaw—Resection of the Left Superior Maxilla and Treatment of Recurrent Growth by Radium.

By P. WATSON-WILLIAMS, M.D., and N. S. FINZI, M.B.

THE patient, aged 69, had a swelling on the left side of the hard palate which his dentist had noticed seven years previously. The left nasal passage had become somewhat obstructed, and slight fullness noticed externally over left cheek when first seen by exhibitor in December, 1911.

On January 23, 1912, a growth was removed from the antrum, the anterior, inner, and outer walls being removed, but not the roof. The growth had invaded the floor, and was there stripped off the soft tissues of the palate. The growth was reported by Professor Walker Hall to be a round-celled sarcoma of slow growth. The long history of the palatal swelling seemed to justify the hope that it was of relatively slight malignancy.

The patient recovered, and it was thought the growth might not recur. But when seen in September the palate showed an elevated ulcerating growth resembling epithelioma. Histological examination showed the same structure as the original neoplasm.

On September 22 the superior maxilla was removed, but the growth had extended into the pterygo-maxillary fossa. It was removed as far as possible, but obviously without success, as it recurred in several places, and marked enlargement of the deep glands of the left side of the neck developed. The patient's urine was loaded with sugar, the glycosuria having arisen during the past few months.

Dr. N. S. Finzi has been treating the patient with radium with some amelioration, but his condition was considered hopeless before he was asked to see him.

Dr. WATSON-WILLIAMS said the case was shown not as an instance of the efficacy of radium in sarcoma, for the patient's general condition, and the very extensive and deep-seated growth, convinced him that the case was hopeless. Nevertheless, the improvement following his radium application was very decided, but the patient was not by any means free of the growth.

Small Round-celled Sarcoma; Partial Removal and subsequent Treatment by Radium.

By P. WATSON-WILLIAMS, M.D., and N. S. FINZI, M.B.

E. C., AGED 40. Enlarged gland noticed below angle of right lower jaw in February, 1912. It was diagnosed as probably tuberculous and was treated with tuberculin, but as it gradually increased and the right tonsil was somewhat enlarged the gland and the tonsil were removed. The macroscopic appearance of the gland suggested sarcoma, and the the histological examination by Professor Walker Hall confirmed this suspicion.

Patient was averse to any extensive operation, therefore it was decided to treat her with radium. Application of 200 mg. radium bromide have been made by Dr. Finzi for thirteen hours in three days (October 19 to 21); exposures of right tonsil region inside and to the thickened matted tissues behind and below the angle of the jaw. There is now no evidence of the former growth.

Sarcoma of the Right Superior Maxilla; Removal of Jaw and subsequent Applications of Radium for Recurrence.

By P. WATSON-WILLIAMS, M.D., and N. S. FINZI, M.B.

E. M., FEMALE, aged 30. First seen July 9, 1912, complaining of dull aching in right cheek for a few months. There was an obvious smooth, rounded fullness over the right maxillary antrum (first noticed by a dentist in October, 1911), a smooth swelling of the hard palate on the corresponding side, and the right inferior and middle turbinals were pushed in, partially occluding the right nasal passage. The exhibitor's antral exploring syringe was used, the needle passed through the middle meatus, and a small portion of the growth sucked into the needle enabled Professor Walker Hall to report that the antral growth was a large round-celled sarcoma.

Operation, July 10 : Removal of right upper jaw, the antrum being found filled with growth which had involved the roof, outer wall and floor and extended backwards to the pterygo-maxillary fissure. She recovered without any noteworthy feature. By carrying the infra-orbital incision higher up towards the inner canthus than usual, one gets little external deformity as the zygomaticus major is divided near its upper insertion. Professor Walker Hall reported that sections showed the growth was a large round-celled sarcoma (osteoid sarcoma).

July 25 : Portions of recurred growth reported to be osteoid sarcoma removed from floor of orbit and from alveolar margin.

July 31 : These areas were operated on afresh, but similar recurrences developed in the orbital floor far back and in the pterygo-maxillary fissure.

She has since then been treated by Dr. N. S. Finzi at the Metropolitan Hospital and appears to have remained free from any evidence of recurrence.

Radium bromide 200 mg. used for exposures, with $\frac{1}{2}$ in. platinum filter : (a) August 22 to 28, four exposures ; (b) October 14 and 15, exposures lasting twenty-four hours altogether.

DISCUSSION.

Dr. FINZI said that in the last case the radium was applied continuously for ninety-six hours, starting August 23, 1912, forty-eight hours packed in the cavity and the rest of the time on lint externally ; the radium employed was 200 mg., and the metallic filtration of the rays used was 2 mm. thickness of platinum. She had a second exposure on October 14, lasting altogether twenty-four hours. The first case, that of the old man, had the same quantity of radium and the same filtration ; he had it packed inside the nose for forty hours, outside, over the glands on both sides of the neck ; the application lasted altogether two days. A second similar application had just been completed. It must be remembered that this case was one which was absolutely hopeless, and the radium was applied solely with the idea of affording relief, and it had certainly done so. The second case was one of sarcoma of tonsil which had been removed, but in which there was a swelling in the neck. She had an exposure with radium against the tonsil, with the same filtration and the same amount of radium, for four and a half hours, then she had fourteen and a half hours with the radium outside, on lint under the jaw, and another fourteen and a half hours just behind the jaw. There was a severe reaction afterwards, but the tumour had disappeared. With regard to the class of case in which radium was useful—where the growth was in the upper jaw, the round-celled sarcomata were almost invariably benefited by radium. Some of his best cases were of that class of growth. The extremely rapidly growing epitheliomata which had started in the antrum and recurred

rapidly when it was removed surgically also did very well with radium. Some epitheliomata were very refractory; the squamous-celled growth of the mucous membrane as a rule did badly, but he had occasionally had good results there also.

The PRESIDENT said the Section should be grateful for this indication of the kind of cases which radium might be hoped to relieve. Up to the present it seemed impossible to do anything curative with squamous-celled epitheliomata, especially of the buccal laryngeal or œsophageal mucous membranes; at least this was the experience at the Radium Institute where there was no difficulty in obtaining requisite quantities of radium.

The Tonsillectome—a New Type of Guillotine or Tonsillotome specially designed for the Enucleation of Tonsils.

By J. F. O'MALLEY, F.R.C.S.

THIS instrument is intended for enucleation only, hence my reason for calling it a *tonsillectome*. The original pattern was designed by
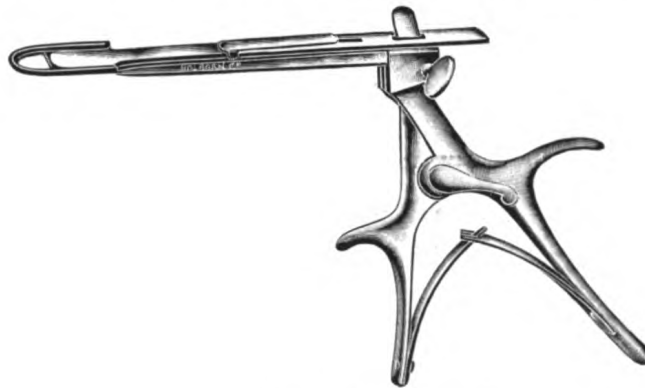
The tonsillectome.

Ballenger, of Chicago, for Sluder's method. This instrument differs in many details from Ballenger's, and has been gradually evolved to meet the difficulties of enucleation as they arose in the method which I use. I have used this type of instrument for over a year in close on 1,000 cases, with very satisfactory results. With the two sizes, 100 per cent. of tonsils can be removed as completely as it is possible by any other method of enucleation, each tonsil taking four to five seconds. The hæmorrhage is exceptionally slight, being only an average of 3 dr. for both tonsils in a large series of cases. The smaller size is ample for over 90 per cent. of the tonsils found in children up to 12 years of age. The larger size is needed for the remainder of nearly 10 per cent. and

for the cases of large, adherent tonsils of young adults. The essential features are :—

(1) The ring is solid, having no slot.

(2) It is thin, being only $\frac{1}{16}$ in. on cross-section.

(3) The upper and lower rims which form the ring are brazed together, leaving on the inner or concave aspect a small recess. This is filled with lead, on to which the blade is driven.

(4) The shaft and blades are $6\frac{1}{2}$ in. long. The shaft is stout and strong, and the blade is blunt.

(5) The opening of the smaller size gives the following measurements: (*a*) transverse diameter $1\frac{1}{16}$ in.; (*b*) antero-posterior diameter $\frac{10}{16}$ in. The larger size is $1\frac{3}{16}$ in. each way.

(6) The posterior end of the opening is square (not round or oval).

(7) The margin of the upper rim around the opening is square (not bevelled, as in the usual type of tonsillotome).

(8) A lever in the handle drives the blade home.

It was made for me by the Holborn Surgical Company.

The advantages claimed for the special features of this instrument are the following :—

(1) The ring, being solid, is strong without being bulky, and is consequently more easily slipped under the deep aspect of the tonsil than the usual type of slotted ring.

(2) The absence of a slot, and the blunted blade, reduces the cutting power of the instrument to a minimum, and accordingly the risk of button-holing, and cutting through the anterior pillars, base of the tonsil, and edges of the capsule.

(3) The cutting is practically reduced to that of the mucous membrane surrounding the free aspect of the tonsil, as the blunted blade when properly inserted travels in the plane between the pharyngeal aponeurosis and the capsule, inverting the latter. When the dull blade is driven home against the leaded face, the blood-vessels entering the periphery of the tonsil are crushed, and when the instrument is turned on its own axis to remove the gland, the vessels are torn across and the bleeding is slight in consequence.

(4) The stout shaft provides for the strength necessary, to resist the pressure used in raising the tonsil forwards, and prevents the springiness which causes the blade to jump out of its socket.

(5) The smaller the opening in relation to the size of the tonsil— if the latter can be crowded comfortably through—the more readily will the capsule be completely inverted.

(6) The small opening and thin ring keeps the size of the instrument such that it can be introduced between the faucial pillars of patients of any age, from early childhood upwards, and is still large enough for nearly 90 per cent. of the cases one meets with.

(7) The square posterior end of the opening allows a little more room at the angles without increasing the size of the instrument; and the straight edge so formed is parallel to the anterior pillar when the tonsillectome is properly in position, and acts as a guide for the insertion of the blade.

(8) By having the upper margin around the opening square instead of bevelled, it is capable of raising a fold on a flat skin or mucous surface, and will therefore grip under the flat, friable tonsil whose lower pole is shelving.

(9) The lever in the handle enables one to apply more force in thrusting home the blunt blade than is possible by thumb pressure. The use of this lever will present a little difficulty in the beginning to those operators who have always been accustomed to thumb pressure.

DISCUSSION.

Dr. WATSON-WILLIAMS was sure the principle of the instrument shown was the right one; more than a year ago he had designed a similar instrument, and more recently Professor Ballenger had shown him his original tonsil forceps, which was very much like his own design. He did not think it necessary to have quite such a long blade.

Dr. IRWIN MOORE congratulated Mr. O'Malley on his improvement, but thought the Heath guillotine would be hard to beat. With the reinforced pattern of the latter the enucleation of the tonsils by means of the guillotine was perfectly simple.

Mr. O'MALLEY said he found his instrument very effective, and he was in the habit of operating on thirty cases in a morning, at his hospital, in two hours.

Tumour of the Right Superior Maxilla.

By J. F. O'MALLEY, F.R.C.S.

F. W., AGED 26, noticed swelling two months ago. Onset gradual; has steadily increased. No pain or tenderness at any time. No nasal discharge or obstruction.

Examination: Hard swelling on anterior aspect of right superior maxilla. It extends upwards to infra-orbital margin, inwards on nasal process and down to alveolus. It does not involve the orbital, palatal, or nasal aspect of the maxilla.

Transillumination : The left crescent is clear and distinct.   The right is present, but not so clear as the left.

Lavage : The solution passed in and out freely, and unstained.

No X-ray examination was made, as the time did not allow.

There were two questions of interest in this case.   The first was to determine whether the antrum was involved or not ; and the second, if it was affected, what was the nature of the disease ?   The absence of pain or tenderness, no nasal discharge, no alteration in the orbital, palatal, or nasal walls of the antrum, no egg-shell crackling, and the results of transillumination and lavage practically exclude any affection of this cavity.   The hardness of the swelling, the absence of pain or tenderness, and of infiltration of the superficial tissues, and no pulsation, point to a benign growth such as an osteoma.   The history of two months' growth is, however, rather short for an osteoma of this size.

DISCUSSION.

Mr. WRIGHT said he thought the skin was adherent over it, and it felt very much like a periosteal sarcoma of the malar bone.

Mr. O'MALLEY replied that he examined the case carefully under cocaine and adrenalin.   There was some inflammatory reaction to-day round the puncture of the trocar and cannula, and that was the cause of some oozing of a serous exudate which led one of the members, earlier in the evening, to think that the nose was being invaded by an antral growth.   There was no trace of bulging on the previous day.'

A Case of Tuberculous Ulceration of the Pharynx with Involvement of the Larynx.

By SOMERVILLE HASTINGS, M.S.

PATIENT is a young woman, aged 24.   Two months ago she began to complain of aching pain in the throat, especially on the left side. A little later the voice became slightly hoarse and a cough developed. The pain in the throat is now more severe, and at times keeps her awake at night.   There is some pain in swallowing, but this is not severe. The pharyngeal surface of the left tonsil is covered by a rough, nodular growth, ulcerated in places, which has spread to both pillars of the fauces and to the soft palate, and extends downwards as far as the epiglottis. The growth is firm to the touch, but there is no deep induration.   The epiglottis is swollen and pale, and so are both arytænoids.   The cords are normal.   The uvula is red and œdematous, and a lymphatic gland

about the size of a filbert-nut can be felt behind the angle of the jaw on the left-hand side.

Dr. R. A. Young reports prolonged expiration at both apices, and a slightly impaired note at the right apex behind, and thinks both lungs are affected by tuberculosis. Wassermann's reaction is negative, and a small portion of the growth removed for histological examination shows typical giant cell systems.

Tumour of Region of the Left Palate.

By HUNTER F. TOD, F.R.C.S.

MALE, aged 40, tumour first noticed two weeks ago; painless. Was twice incised by the doctor, who thought it was a quinsy. The post-nasal space is found to be partially blocked owing to the swelling of the soft palate posteriorly.

Swelling and Ulceration of Subglottic Region of the Left Side of the Larynx.

By HUNTER F. TOD, F.R.C.S.

FEMALE, aged 28. The patient had a large mass on the left side in the subglottic region, and fixation of that side of the larynx. She had been treated for tuberculous trouble of the left knee-joint for three years. Some hoarseness and cough for about one year. No tuberculous disease of lungs. Mr. Tod regarded the case as tuberculous, and invited suggestions as to treatment.

Sir FELIX SEMON said he would be afraid to do anything in this case on account of the complete fixation of the crico-arytænoid articulation. He did not see any immediate necessity to interfere.

Case of Post-nasal Tumour.

By NORMAN PATTERSON, F.R.C.S.

PATIENT, a woman, aged 48. Post-nasal growth removed ten years ago by Dr. Lambert Lack, to whom I am indebted for permission to show the case.

Recurrence: On November 11, 1912, in Dr. Lack's absence, I removed, by means of a snare, a tumour the size of a walnut, from the

region of the left Eustachian tube. It was a firm fibrous mass and presented no ulceration.

Four years ago gathering in left ear. Watch now not heard on contact.

Growth appears clinically to be benign, but pathologists report on last specimen that it is a squamous and polygonal-celled carcinoma.

Patient now shows some fullness over the left Eustachian orifice, but there is no ulceration.

Opinions as to the nature of the tumour and the treatment to be adopted are invited.

DISCUSSION.

The PRESIDENT said he had seen seven cases of endothelioma of the lateral wall of the nasopharynx. The cases had all been fatal. They usually produced deafness, with serous effusion in the tympanum, anæsthesia of the third division of the fifth nerve, and mechanical fixation of the levator palati. At first he thought this case was endothelioma, but the history seemed too long for this view to be maintained. Each of his cases recurred in six or seven weeks to two months after operation.

Mr. PATTERSON replied that he had had an endothelioma in a patient, aged over 50. He removed it as far as he could through the soft palate, but it recurred in two or three weeks. There was great pain in the occipital region and a discharge from the ear.

Swelling of the Larynx.

By W. H. KELSON, M.D.

THE patient was a woman, aged 40, suffering from swelling of the left arytænoid, left ventricular band, and adjacent part of pharyngeal wall. She stated that discomfort had come on directly after a meal about a week previously. The left cord did not seem to be affected. No history or indication of tubercle or syphilis could be obtained. The affected parts looked very œdematous.

[Subsequent history : A week after the exhibition of the case a free discharge of pus took place and the whole swelling subsided.]

Mr. WRIGHT said the case looked to him like one of acute perichondritis with abscess, or possibly sub-perichondrial hemorrhage resulting from the strain of vomiting. The patient had a similar attack a year ago, and she had now got considerable swelling on the left side, apparently fluid, involving the arytænoid and the false cord region, practically blocking up the whole of that side of the larynx.

Laryngological Section.

January 10, 1913.

Mr. HERBERT TILLEY, President of the Section, in the Chair.

Temperature Chart from an Obscure Case of Streptococcal Infection of the Throat.

By HERBERT TILLEY, F.R.C.S.

ON November 18, 1912, I saw, in consultation with his physician, a boy aged 10, who had been confined to bed for a fortnight because of an evening temperature which regularly reached about 100° F. Otherwise, his general health was good, he was well nourished, and his spirits were excellent. Tuberculous glands had been removed from his neck three years previously. At the commencement of his illness he had a slight sore throat, the small tonsils were a little red and swollen, especially on the right side, where the corresponding gland under the angle of the jaw was tender on pressure. These symptoms quickly disappeared, but the evening rise of temperature continued. Careful and repeated examination of the chest, abdomen, joints, excreta, &c., failed to give any clue as to the cause of pyrexia.

When I saw him on November 18, the soft palate and fauces were a little congested, tonsils small, and no exudate in the mouths of the crypts. Nasal cavities and ears normal.

November 20: I pressed out some foul-smelling exudation from each intra-tonsillar fossa, and next day small lenticular ulcers appeared where pressure had been applied; they healed very slowly, in spite of frequent gargles, mouth-washes, pastilles, &c.

November 24: Swabs taken from the region of the right tonsil revealed streptococci in almost pure culture.

November 25: Dr. Eyre ascertained the presence of a few streptococci in urine removed by catheter from the bladder.

November 27: Evening temperature, 101·6° F.; shivering fit.

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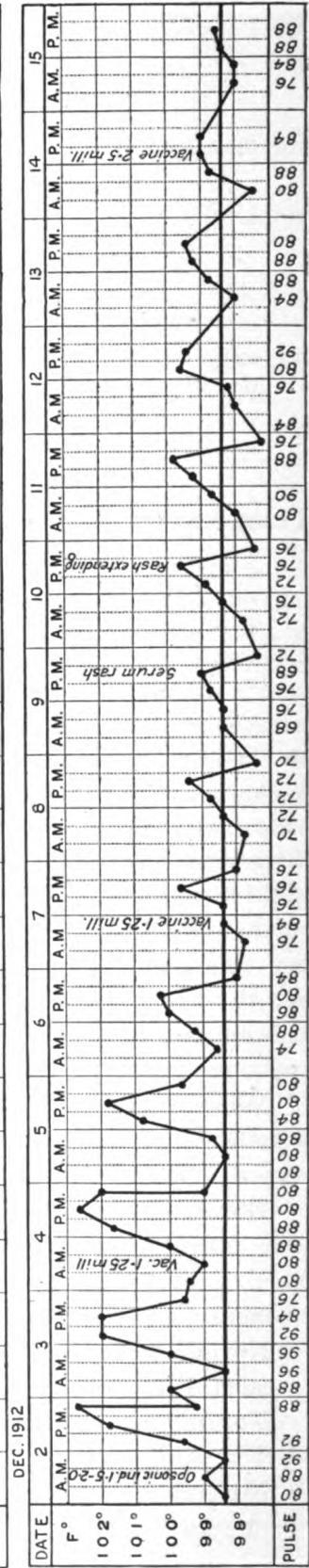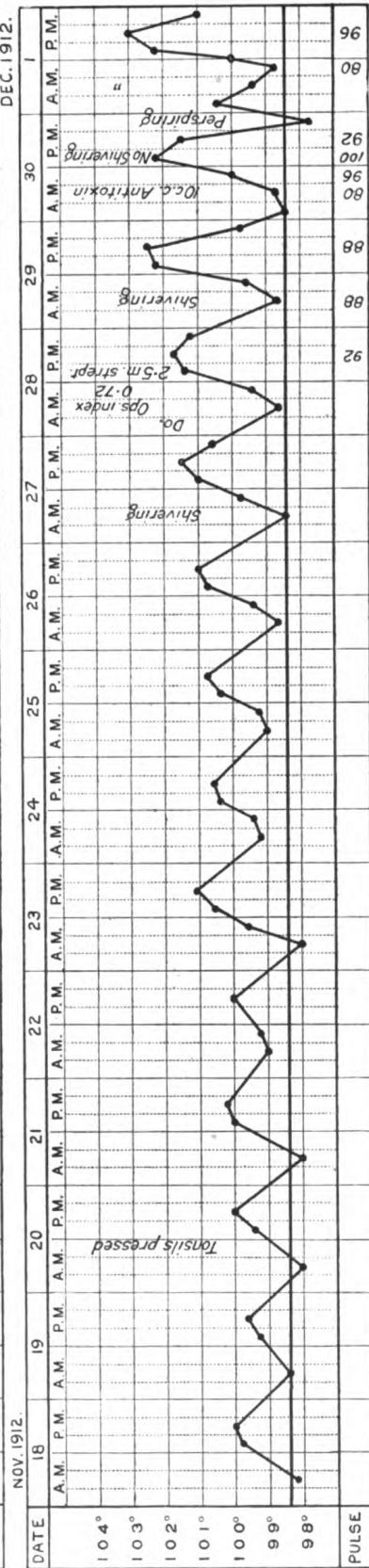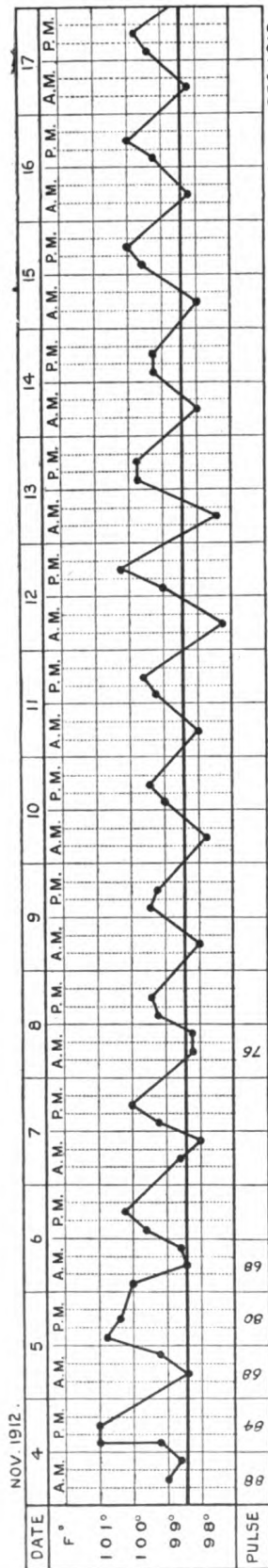
Temperature chart from case of streptococcal infection of the throat.

November 28 : Opsonic index to *Streptococcus longus,* 0·72 ; 2·5 millions of autogenous vaccine of mixed streptococci and staphylococci injected.

November 29 : Temperature, 102·4° F.; shivering fit.

November 30: Ten cubic centimetres polyvalent antistreptococcus serum* (Lister Institute) injected.

December 1: Temperature 103° F.; 1·25 millions of autogenous streptococcus vaccine.

December 2 : Opsonic index, 1·5—2.

December 4 : 1·25 millions of vaccine.

December 5 : Temperature falling.

December 7 : Temperature, 99·6° F.; 1·25 millions of vaccine injected.

From this point onward the patient made an uninterrupted recovery.

The interesting features in the case are : (*a*) The very slight throat symptoms and pathological appearances, combined with a definite and otherwise obscure pyrexia. (*b*) The excellent general condition of the patient during the greater part of his illness. (*c*) The appearance and slow healing of the small ulcers caused by the pressure of a wool-covered strabismus hook on the outer surface of the tonsils.

Note by Dr. Eyre : The interesting points from the bacteriological point of view are : (*a*) The isolation of a streptococcus apparently identical with that causing the throat lesion, from the otherwise normal urine—from 10 c.c. of a catheter specimen two colonies being obtained —pointing to the value of urine examination in pyrexial attacks of obscure origin, since pathogenic bacteria are apparently—at times— filtered off and excreted by the kidneys. (*b*) The lack of response on the part of the patient to a vaccine prepared from the throat exudate, in which approximately equal numbers of streptococci and staphylococci were present, and the immediate response to an autogenous vaccine prepared from the streptococcus derived from the urine, unmixed with other organisms.

DISCUSSION.

The PRESIDENT (Mr. Herbert Tilley) added that there was little to be seen in the throat beyond a redness similar to that observable in the throat of a cigarette-smoker. The tonsils were not enlarged, and it was difficult to make up one's mind from mere appearances that the throat could be the source of the general infection.

Mr. DE SANTI asked whether the President considered it an acute infection. He had recently seen a streptococcal case, in a professional man well known

in London. There were no symptoms, but cultures taken from the throat showed pure streptococcal infection—*Streptococcus longus.*   A bad odour emanated from the mouth, and the man himself felt sure his throat was affected.   Two years before he had a retropharyngeal abscess, and had nearly died.   He was injected with an autogenous vaccine, but without benefit.

Mr. STEWARD mentioned a boy under his care, aged $9\frac{1}{2}$, who had had four similar attacks in twelve months.   He did not examine the throat in the first three.   The attacks consisted of general malaise with pyrexia, the temperature running up to 104° F.   No other symptoms were present and no other cause could be discovered, but he was always supposed to be going to have an exanthem.   When examined in the fourth attack a little spot was found on one tonsil.   Dr. Eyre took a culture, found the *Streptococcus longus*, and proceeded to prepare a vaccine; but during the next twenty-four hours the temperature subsided, and the boy got well.

Dr. DAN MCKENZIE, in view of the lack of response to a vaccine prepared from the patient's throat, asked if the streptococcus recovered from the throat had anything to do with the streptococcus recovered from the urine.   He understood that various strains of streptococci might have no relationship with each other.

Mr. E. D. DAVIS asked if there was any possibility of it being a pneumococcal throat.   There was great variability if the pneumococcus was not encapsuled.

The PRESIDENT replied that he scarcely knew how to answer the question whether it was an acute infection.   When he saw the lad, he was particularly free from acute local or general symptoms ; he was happy and comfortable, took his food well, and slept soundly.   Therefore the illness could scarcely be termed an acute infection.   With reference to Dr. Jobson Horne's suggestion as to the value of sea air, the patient was brought from the sea-side, where he contracted his illness.   With regard to enucleation, he wished to exhaust every means of getting the boy well without operation.   It was difficult to be certain whether the patient got well because of the inoculations of vaccine, or whether convalescence would have been established without that form of treatment.

Tuberculous Ulcer on the Right Vocal Cord in an Elderly Man cured by the Application of the Galvano-cautery.

By HERBERT TILLEY, F.R.C.S.

THE patient applied to the hospital on account of hoarseness ; he was being treated for pulmonary tuberculosis.   The posterior three-quarters of the right vocal cord was occupied by a shallow ulcer surrounded by pale granulations.   By the direct method, three deep

punctures were made through the floor of the ulcer with the galvano-cautery and at the one sitting. The ulcer has quite healed and only a slight congestion of the cord is to be seen.

The PRESIDENT said that at present the patient had well-marked physical signs at the back of the right apex and tubercle bacilli in his sputum. He was going to a sanatorium in the course of a week. It was quite easy to use the direct tube with cocaine, and galvano-puncture could be carried out with great accuracy. Of course the indirect method could probably have been used, but he did not think he could have applied the cautery as accurately with it as with the direct method.

Granular Congestion of Left Vocal Cord, probably Specific in Origin.

By HERBERT TILLEY, F.R.C.S.

THE patient is a male, aged 54. First seen, October 18, 1912. He had suffered from hoarseness since childhood; worse in spring and autumn. The last attack was present for three weeks. He had lost 10 lb. during the three months previous to my seeing him. There is a history of syphilis. The left vocal cord was granular and congested and a small superficial ulcer occupied its posterior third. The history and appearances suggested tuberculosis, but pulmonary signs are entirely absent and the ulcer has disappeared under potassium iodide, while the rest of the larynx has improved to the condition in which it now is.

Case of Cyst of the Pituitary Fossa; Operation by the Nasal Route.

By C. I. GRAHAM, F.R.C.S.

FEMALE, aged 37; admitted to St. Mary's Hospital under Dr. Wilfred Harris on November 8, 1912, for failing sight for eighteen months, temporal headaches, drowsiness, slow mental reaction, and incontinence of urine for several months.

On admission: Articulation good; slow reaction time; drowsy; right temporal headache. Right eye—blind, optic atrophy, pupil shows only consensual light reflex. Left eye—vision present in nasal field,

pupil dilated and shows neither direct nor consensual light reflex. Urine normal, 16 to 24 oz. daily; no trace of sugar in urine for twenty-four hours after administration of $7\frac{1}{2}$ oz. glucose. Skiagram shows pituitary fossa flattened out and enlarged. Temperature, 98·4° F.; pulse, 82; respiration, 20.

By November 26 the drowsiness had increased almost to coma; incontinence of urine and fæces; eyesight worse; respirations had slowed to nine or ten per minute. Urotropine (90 gr.) was given by the mouth.

Operation (November 27, 1912): Half an hour before operation morphine ($\frac{1}{4}$ gr.) and atropine ($\frac{1}{150}$ gr.) were injected subcutaneously. A quarter of an hour before operation both nasal fossæ were packed with gauze strips soaked in 1 in 1,000 adrenalin containing 5 per cent. cocaine. Anæsthesia was induced by the intravenous injection of ether solution. The nasal vestibules, the upper lip, and neighbouring skin of the face were painted with tincture of iodine (B.P.) and a sterilized cloth was laid across the lower part of the face, a hole being cut in the cloth to admit of access to the nose. Illumination was obtained by means of a Nernst light reflected from a frontal mirror. One assistant was employed to keep the field of operation free from blood. The incision, which was made through the skin, commenced at the tip of the nose and was carried to the upper lip, dividing in its course the columella and about $\frac{1}{8}$ in. of the philtrum, keeping accurately in the middle line. The free edge of the septal cartilage was defined and the skin of the vestibule raised from each side of the septum. It was at this stage that the oozing of blood from minute points caused considerable delay in raising the vestibular skin, but the difficulty was overcome by assiduous mopping; and from this stage to the completion of the operation the hæmorrhage was insufficient to cause inconvenience, regular mopping being all that was necessary. The mucous membrane was easily raised from the sides of the septum and the elevation was carried back to within 1 in. of the posterior edge. A speculum with narrow, 3-in. blades held the mucous flaps aside during the removal of that part of the septum which corresponded in antero-posterior depth with the raised mucous flaps, and in vertical depth with the skin incision, the tip of the nose being firmly upturned by the hand holding the speculum. The mucous membrane over the posterior edge and upper part of the vomer was raised by means of a dental "stopper" which terminates in a single corkscrew turn; the excursion of the instrument along the posterior edge of the vomer was controlled by the
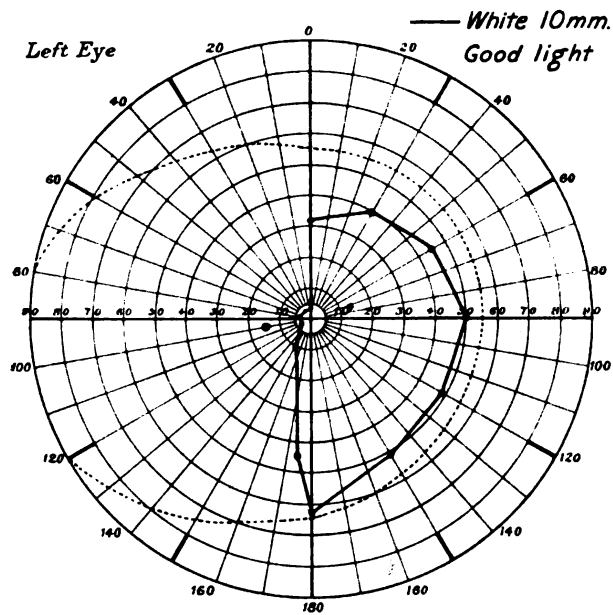
A. S. December 17, 1912.
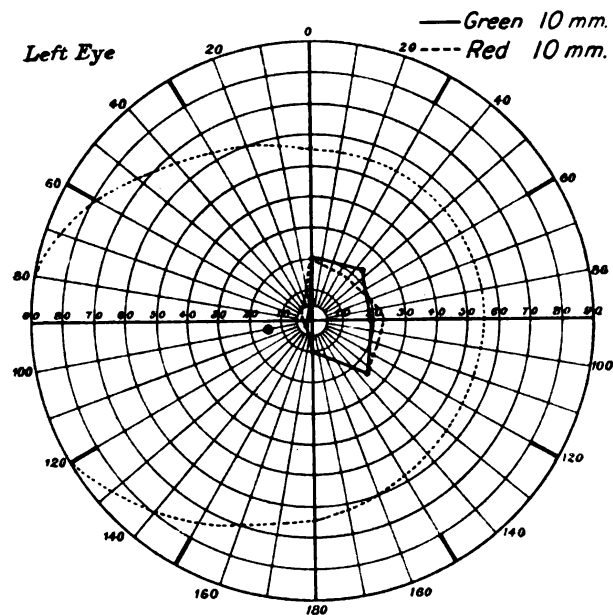
A. S. December 17, 1912.

index-finger of the left hand in the post-nasal space. Killian's long nasal speculum with flat blades, ½ in. by 4½ in., was then substituted for the smaller instrument, and the vomer was twisted from its attachment to the sphenoid by means of Luc's ethmoidal forceps. As it was found that the middle turbinals encroached upon the mucous membrane tunnel, they were forcibly separated by means of a metal glove-stretcher, with screw attachment on the handles, the blades being inserted into the tunnel. The mucous membrane was then elevated from the anterior surface of the sphenoid so that the ostia of the sinuses were clearly brought into view. The anterior wall and intersinous septum of the sphenoid were removed by means of small blunt hooks and Luc's ethmoidal forceps. The sinuses were symmetrical and there was no bulging to indicate the position of the pituitary fossa. The position of the pituitary fossa was found by taking a line which commences at the junction of the alæ nasi and upper lip, and runs upwards and backwards towards the junction of the pinna with the side of the head, and this line will be found to pass immediately beneath the lower and outer margin of the orbit. A line commencing at the same spot and traversing the lowest part of the cavity of the orbit will be found to encroach upon the optic chiasma. The opening into the pituitary fossa was made by placing a long chisel parallel to the correct line, with the cutting edge against the roof of the sphenoidal sinus, and then cracking the bone by a few gentle taps of a hammer, a mastoid burr with a small head completing the stage. Immediately the bone was removed there was a rush of from 1 to 2 dr. of blood-stained fluid, and when the fluid was removed dura mater was found to be lying against the opening. After enlarging the opening in the bone the dura mater was incised, and as this gave rise to brisk hæmorrhage on the two repeated attempts at exploration, the operation was concluded by swabbing out the area of operation with mops soaked in 1 in 4,000 aqueous solution of mercury biniodide, and then inserting a suture near each extremity of the skin incision, and sealing the wound by collodion and cotton-wool.

Before consciousness returned respirations were 24, temperature 97° F., pulse 100. During the first twenty-four hours after the operation there was great thirst, frequency of micturition, and polyuria (100 oz.). She was excited and garrulous.

The local after-treatment consisted of instillation of hydrogen peroxide into the nasal fossæ, followed by gentle irrigation with normal saline. Sixty grains of urotropine were given by the mouth upon the third and fourth days after operation respectively, then from the fifth day to the seventeenth inclusive 45 gr. were given daily.

December 12 (fifteen days since operation) : No incontinence since operation ; the patient is practically normal with the exception of the sight, which she thinks has improved slightly. She has been getting up daily since December 10.

The patient left the hospital on December 17, 1912, twenty days after the operation.

Dr. DAN MCKENZIE said that, so far as he knew, this was the first case of the kind which had been operated upon in Britain, and Mr. Graham was to be congratulated upon his success. A fair number of cases had been dealt with successfully abroad. He thought the object of selecting the route for sub-mucous resection was to minimize the chances of infection, and that probably contributed to the success. With regard to the non-recovery of sight, he supposed that to be due to the fact that the damage to the eye had lasted too long.

Two Cases of Laryngeal Palsy due to Nuclear Lesions of the Vagus.

By L. COLLEDGE, F.R.C.S.

Case I.—Patient is a girl, aged 20, who came to the out-patient department complaining of nasal obstruction. No other disorder was noted nor complained of at the time. She was admitted to St. George's Hospital on December 9. She then complained that in addition she had recently had difficulty in swallowing, and her food and drink had been coming back through the nose. Also four days before admission she suddenly noticed loss of vision in the left eye. Condition is as follows : Central scotoma of left eye, vision $\frac{6}{60}$; paresis of left external rectus muscle ; paresis of left half of soft palate ; paresis of left sterno-mastoid muscle ; abductor paralysis of left vocal cord. Wassermann's reaction is negative.

Case II.—Patient is a girl, aged 7. She was admitted to St. George's Hospital on November 18 for acute mastoiditis, and Schwartze's operation was performed. As the pulse and temperature remained irregular and the wound did not heal satisfactorily a radical operation was performed on November 30. There was no evidence of tuberculosis in the aural discharge. Condition otherwise is as follows : Complete paralysis of left vocal cord : the cord is in the cadaveric position, it is relaxed and sickle-shaped and the arytænoid is prolapsed forwards ; paralysis of the left

trapezius and sternomastoid ; atrophy and paralysis of the left half of
the tongue. In addition the pulse has varied between 120 and 146
ever since admission, which may be due to interference with the
functions of the vagus. The diagnosis in both cases is a lesion in the
left half of the medulla, probably tuberculous in nature.

DISCUSSION.

Mr. ROSE said he had seen a girl, aged 17, who had similar symptoms, but
on the right side ; a very careful examination was made to find the cause, but
with no result. She was kept under observation for two or three months, and
during that time she completely recovered. She was taking iodide of potassium,
but there was no other reason for supposing she had syphilis.

The PRESIDENT said that of the cases with somewhat similar lesions that
he had shown, one was syringomyelia, and the other in an adult who had
paralysis of the trapezius, sternomastoid, left vocal cord, and left side of the
palate. This case belonged to the same category as the cases described by
Hughlings Jackson and Morell Mackenzie years ago, references to which would
be found in the *Proceedings of the Laryngological Society*. Some of these were
probably due to pachymeningitis involving the membranes at the base of the
skull and the foramina where the cranial nerves made their exit.

Congenital Membrane of the Larynx.

By GEORGE W. BADGEROW, F.R.C.S.Ed.

THE patient, a boy, aged 6, was sent to me complaining of weakness
of voice. On examination of the larynx a membrane is seen situated at
the anterior commissure stretching between the cords, an opening only
left in the posterior part of the glottis. There does not seem to be
any interference with respiration. Should treatment be undertaken ?

DISCUSSION.

The PRESIDENT said that years ago Sir Felix Semon wrote of one or two
cases in which the congenital laryngeal web was associated with coloboma iris.
The latter condition was not present in this boy.

Mr. A. J. HUTCHISON said that many years ago he saw a child who was
under the care of the late Mr. Baber, and who had a congenital web. It was
operated upon by the late Sir H. T. Butlin and the result was very unsatis-
factory, as though breathing was somewhat better and the child took more
exercise, there was no improvement in the voice and she could not yet speak
above a whisper. She could not take more active exercise than golf.

Dr. DONELAN said that the most important factor in the case was that there was no interference with respiration. While that was so he thought that it would be better to avoid any treatment. As the general experience appeared to show, the treatment of these webs was always most difficult and unsatisfactory. He thought the only reliable way of affecting a speedy cure was that followed in Dr. Hill's case, in which the result had been most satisfactory.

Dr. FITZGERALD POWELL said the consensus of opinion in the meeting seemed to be that the case should be left alone at present. If operation were found necessary for the safety of the boy, he thought the method he had used for stenosis of the larynx would be the best. A high tracheotomy was performed, and through this opening it would be possible to incise the web; having done this, suitable silver plugs—such as were mentioned by Mr. Lack in Cheyne and Burghard's " Surgery "—were inserted upwards into the larynx above the tracheotomy tube and lying on it. These plugs were used continuously for a period of six to twelve months and the result in the cases of stenosis in which they were used was excellent. The tracheotomy wound was allowed to heal, the larynx remaining quite patent.

The PRESIDENT said it would be interesting if, in the light of this discussion, Dr. Hill could arrange to show his case again. If in removing the web two raw surfaces were made, unless means were taken to prevent the opposing granulations from uniting, the original evil would be reproduced. He had had considerable experience of these cases of recurrent papillomata of the larynx, and in the inveterate cases it might be advisable to consider splitting of the larynx and inserting the " wing " obturators, so that one could deal directly and very frequently with the first signs of recurrence and without the necessity of general anæsthesia.

Dr. DUNDAS GRANT, while agreeing that the case was best left alone for the present, said the chief anxiety would be lest the child had one of the exanthemata, in which case the laryngitis would be apt to be suffocative. If tracheotomy should have to be done, then plugs could be used, as mentioned by Dr. FitzGerald Powell, or those devised by Dr. Thost, of Hamburg.

Mr. BADGEROW, in reply, thanked the members for their opinions, and thought it wise to leave the case alone for the present.

Case exhibiting Lingual Gymnastics.

By E. A. PETERS, M.D.

MISS A., aged 35, is able to pass her tongue behind the soft palate, where the Eustachian tubes and inferior turbinals are recognized thereby. It has been said that certain cases of suicide have been effected in this way.

DISCUSSION.

Dr. SYME said he had seen one such case in a girl, the subject of atrophic rhinitis. It might be that she had gradually brought on her condition by working her tongue back into the nasopharynx to allay the irritation. He thought the hard palate here was shorter than usual, and the soft palate seemed to have developed excessively.

Dr. DAN MCKENZIE did not agree that there was any deficiency in the hard palate, and there was no nasal intonation. He believed the condition was due to the mobility of the tongue. He had seen cases of atrophic rhinitis in which the patient had learned to get rid of the crusts by means of the tongue.

The PRESIDENT said he had been told that this condition was not very uncommon, and that people had been known to commit suicide by pushing the tongue upwards and backwards into the post-nasal space. [Dr. DONELAN : It was a common method of suicide in slave-ships.]

Multiple Papillomata of the Larynx.

By E. A. PETERS, M.D.

L. G., AGED 9, has suffered with dysphonia for three years. Two years ago her tonsils were removed to relieve croup. There are several elongated papillomata of a pinkish-grey colour growing in the region of the false cords. Is this case suitable for the direct or, alternatively, the laryngotomy method ?

DISCUSSION.

Mr. STEWARD agreed with Dr. Horne as to the advantage of operating by the direct method, and persevering until the papillomata were got rid of. In this child, aged 9, they probably would not recur very quickly. He still had cases under supervision on whom he had been operating for six to eight years, and one of them had passed the last year without need of operation. He would not advise Dr. Peters to do thyrotomy in this case, as he would find it practically impossible to keep the larynx open sufficiently long, and there was great danger of subsequent stenosis of the larynx. He had seen extreme stenosis of the larynx follow thyrotomy.

Mr. HOPE said that during 1911 there was a case under Dr. Hill at St. Mary's Hospital on whom he (Mr. Hope) operated by the direct method. The child wore an intubation tube during four days, and then went home. This was done four times during the year, and was very little trouble. The intervals seemed to be getting longer.

Dr. FITZGERALD POWELL said that he thought it very necessary that a tracheotomy should be performed in children with these multiple papilloma

before proceeding to their removal, either by the direct or indirect methods. It protected the child from dangers that might arise, such as spasm or œdema, and the opinion has been held that it had a curative effect in resting the larynx.

Dr. DAN McKENZIE said he showed a girl at the Section[1] who had had tracheotomy performed, as she had cyanosis, and that wound was very useful in subsequent treatment. Papillomata were taken away regularly by the direct method, which afforded a confidence in dealing with them that could not have been felt in the older days. The was no recurrence of the growths two years afterwards. He asked if members had tried carbonate of magnesium internally for the condition, as dermatologists were using it for papillomata of the skin.

Mr. ROSE said he attempted to cure two patients by calcined magnesia administered internally. One of the patients declared she was better, but he was certain that was not so. In the other case, neither the patient nor he thought there had been any result. The age of one of the patients was 40; no attempt had been made to remove the papillomata before, though her symptoms lasted from her sixth year. Therefore, those who hoped a child would grow out of the condition had an uncertain foundation for their belief.

Dr. DUNDAS GRANT considered that repeated operation was the best method, and after removal of the bulk of the growths, cauterization. He had used an alcoholic solution of salicylic acid (not salicylate of soda), as he was convinced it tended to prevent re-growth. But it was absurd to find fault with such a caustic agent because it did not cause a large cauliflower growth to shrivel up at once. Tracheotomy was often necessary, but that was not a " specific " for papillomata of the larynx. He had seen a case which was tracheotomized in early childhood for papillomata of the larynx, in which the patient came under his care at her twenty-first year. He cleared out the papillomata and removed the tracheotomy tube. The patient experienced great pleasure in drawing a breath of fresh air through her nose for the first time.

The PRESIDENT spoke of one boy who attended his hospital every two or three months, and who was said to have been operated upon forty-three times. Certainly he had removed hundreds of papillomata from this boy on different occasions. They had recently crept up the side of the pharynx on to the soft palate, and .below had come out through the old tracheotomy opening and formed not only a mass of granulations around the tracheal opening, but there was a smaller mass growing on the larger mass. The local infectiveness of these warts in some subjects made them seem almost intractable to treatment. In the patient referred to, he had operated several times by the direct method and was satisfied that every visible papilloma had been removed, then a 20 per cent. solution of salicylic acid in collodion had been applied, but the growth rapidly recurred and had not been checked by the internal administration of arsenic.

[1] See *Proceedings*, 1911, iv, p. 80.

Tumour of the Left Antrum.

By E. A. Peters, M.D.

THE patient was shown on March 29, 1912.[1] On that occasion various opinions as to its nature were expressed. Before the operation a trocar inserted through the inferior meatus became impacted in a solid growth. The upper lip was dissected from the canine fossa, which was incised, and revealed a solid mass of soft, cancellous, bone-like tissue. By means of a gouge an attempt was made to reproduce an antrum, which was then opened in the usual way into the inferior meatus. Unluckily the piece of growth received for microscopical examination was thrown away, so that it is impossible to exclude the diagnosis of a slow-growing carcinoma. The tumour was noticed three years ago and expanded the antrum in all directions, except the palate. The outer wall was very hard.

DISCUSSION.

Dr. KELSON said he was interested in this case as, from time to time, cases had been shown before the Section resembling leontiasis ossium and those bony growths of the maxilla common on the West Coast of Africa, yet differing somewhat from both of these. These cases, when brought up, had been thought by some to be due to syphilis, and by others as due to some other micro-organism. They had all been bilateral, but not symmetrical. Dr. Peters's case seemed like that condition limited to one side, and on looking into the nose of this patient he saw that the inferior turbinate on that side was much enlarged, as in his own case. The bone, he believed, would be found to be very brittle. The condition was not malignant, and he believed good results would follow operation.

Mr. HOWARTH said that the case did not at present appear to be malignant, but he would like to know whether it was translucent and what the X-ray picture revealed. He had seen a similar case, which was quite translucent, and which was thought to be a cyst in connexion with one of the teeth; it was outside the antrum, and at the operation it proved to be what was thought. In operating through the labio-gingival fold, the cyst, which was the size of a pigeon's egg, was shelled out without opening the antrum at all. The anterior wall of the antrum had been pushed back so far by the cyst that there was practically no antrum on that side. This present case might be similar. He did not think the turbinate was large, but it had the appearance of being pushed into the nasal cavity.

[1] See *Proceedings*, 1912, v, p. 129.

Dr. SYME said the case reminded him of one shown before the Scottish Otological and Laryngological Society, which was thought by some to be leontiasis ossium, while others regarded it as a cyst. When Dr. Adam, who showed the patient, operated, there was found to be, on both sides, a firm fibrous growth which had undergone osseous changes. Both antral cavities were involved.

Dr. PETERS, in reply, said that the case was shown last year with somewhat similar appearances, and he had operated in the interval. On transillumination the antrum was dark, and there was slight enlargement of bone. An incision was made into the canine fossa last April and an attempt made to fashion a new antrum out of the solid mass of soft bony material. There was no trace of a dental cyst. On talking over the matter with Mr. Westmacott, he thought it might be a case of hyperplasia of the antrum in which vacuolation had not occurred in the maxilla, and that there had been retrogression of the bone and the formation of solid material. In one case Mr. Westmacott scooped out the central mass of the bone to the zygomatic arch. One of that gentleman's cases dated back twenty years, and the patient recovered absolutely.

Unusual Form of Syphilitic Laryngitis.

By C. W. M. HOPE, F.R.C.S.

MRS. A., aged 39, was shown at the November meeting.[1] She was suffering from hoarseness of twelve months' duration. Having been resident in Norway seven years she was shown for diagnosis. ? Leprosy. The uvula, both arytænoids (especially the left), epiglottis, and both ventricular bands showed white, solid swellings; palate was not anæsthetic, and healed scars were seen on the posterior pillars of the fauces and on the post-pharyngeal wall. Cords were normal. No ulceration present. Patient felt very lethargic and disinclined to do anything entailing the least exertion.

The Wassermann reaction proving positive, I gave her, on November 14, 1912, 0·6 grm. of salvarsan intravenously. There was a marked reaction, lasting ten hours. Temperature up to 102° F., vomiting once. On December 11, 1912, patient reported herself as feeling much better generally; hoarseness had all gone. On examination the only swelling in the larynx was a slight reddish enlargement of the left arytænoid. The uvula was still swollen, though much less. A second dose of 0·6 grm. of salvarsan was given, and a reaction as at the first injection occurred.

[1] See *Proceedings*, p. 27.

DISCUSSION.

Dr. LIEVEN (Aix-la-Chapelle), responding to a request for his views and comments on this case, said he noticed that reaction was said to have occurred each time after giving the salvarsan. He did not consider it at all necessary for such reaction to occur, especially in tertiary syphilis. Reaction occurred for two reasons : (1) from the spirochætæ and their toxins, and (2) from the toxic reaction of the arsenical preparation. Every individual had his own limit of tolerance, and by proceeding cautiously that limit need not be exceeded. In Germany, 0˙5 grm. for an initial dose was the rule, and his own practice was to give not more than 0˙35 grm. in the first injection. No reaction should, as a rule, be produced in tertiary syphilis, because there were not enough spirochætæ present. For secondary syphilis it was advisable to eradicate most of the organisms by means of mercury and finish the case off by salvarsan. A dosage which was toxic for a patient once would assuredly be so again ; therefore, if a marked reaction occurred a smaller dose should be given on the second occasion. Dr. Lévy-Bing, at the Hôpital St. Lazare in Paris, having excluded syphilis of the nervous system by a cytological examination of the cerebrospinal fluid in a series of prostitutes with primary and secondary syphilis, gave them injections of salvarsan. About a month afterwards, on re-examination of spinal fluid lymphocytosis was present in every case, so that there had certainly been a neurotropic effect produced by salvarsan. It was vital to avoid the accidents which led to encephalitis hæmorrhagica, and that could be done by limiting the doses which produced no reaction. The dose of 0˙6 grm. given in the present case he regarded as rather large. Even the most experienced syphilologists had their bad cases with quite moderate doses, because one could never foretell the individual tolerance. At Liège, Professor Troisfontaines reported the death of an otherwise healthy girl, aged, he believed, 23, after a dose of 0˙5 grm. She died on the second or third day from hæmorrhagic œdema of the brain. He had seen several patients rendered drowsy or even unconscious from the drug on the second or third day. In his opinion, such cases were due to a temporary œdema of the brain. A lady patient, aged 35, suffering from secondary syphilis, had twenty mercurial inunctions, and subsequently he gave her an injection of 0˙5 grm. It was, however, too much for her, for on the second day he was urgently called to her and she was found to have bilateral paralysis of the abducens, with hallucinations, of which the former cleared up in four days whilst the latter lasted a week. He was always glad when the third day from the injection had passed. With regard to the permanency of the effect of salvarsan, that had been largely solved by Professor Bayet, of Brussels, who treated several large series of syphilitics in the "Hôpital St. Pierre." They were treated without mercury, and got up to five intravenous injections for a period extending in general over five to six weeks, and the clinical result had been very good, whilst the effect on the Wassermann reaction proved to be largely negative. His impression was that by the combined treatment of

mercury and salvarsan relapses during the secondary period, particularly relapses on the mucous membrane of the tongue and pharynx, had become very rare. That was very important, because such treatment must lessen the amount of domestic infection. He knew altogether of five cases of death reported after giving salvarsan, but he was of opinion that a number had occurred in private practice which were not recorded, and the reason for the silence could be well understood. That applied to this country as well as to others. It was the duty of medical men to perfect their knowledge of effective and safe treatment of the disease. One should not go on introducing arsenic into the system just because the Wassermann reaction did not become negative, because it must be left to the future to decide the final effects, if any, of salvarsan on the body, especially as we knew comparatively little as yet of the rate of excretion of the arsenic from the body.

Mr. HOPE replied that when he showed the case in November, one diagnosis was atypical myxœdema, and another was laryngeal hyperplasia, the Wassermann reaction not then being known. He showed the patient again because her general condition had so markedly improved. He agreed that her palate was still much the same as before. He had treated fifty to sixty cases of laryngeal and nasal syphilis with salvarsan, and this was the only one in which there had been a reaction, with temperature or vomiting. But all the other cases had been treated with mercury first, and in all of them he had given the same dose, except for children, for whom it was 0'2 or 0'3 grm.

Case of Dysphagia presenting Unusual Features rapidly remedied by Treatment.

By W. JOBSON HORNE, M.D.

THE patient, a man, aged 49, when he came to the hospital last December had suffered pain on the right side of the throat for one month. The pain had extended to the right ear. He thought that he had been losing flesh during that time, which could be readily accounted for by the fact that he had not been able to take solid or even liquid food. He had had no cough, and there was no history of tuberculosis in the family. Some twenty years ago he had lues venerea —he was at sea, and the treatment was rough but not thorough. At the time of writing these notes a Wassermann test had not been done, the sputum had not been examined, and inasmuch as the dysphagia was confined to the throat itself, and had rapidly improved under treatment, œsophagoscopy had not been performed.

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When first seen the only noticeable feature was a marked deviation of the tongue upon protrusion to the right side. No glands were palpable in the neck. Possibly the right vocal cord did not move as freely as the left. The right side of the base of the tongue was greater than the left side. But apart from these, there was no gross lesion to account for the gross symptoms. Iodide of potassium and perchloride of mercury were prescribed, and the patient was rapidly enabled to swallow. The case is shown with a view of clearing up any doubts about the cause of the dysphagia.

Dr. JOBSON HORNE stated that the dysphagia appeared to be entirely pharyngeal and due to the swelling at the base of the tongue, which he regarded as a gumma. The rapid diminution of the swelling and the accompanying rapid relief of the dysphagia under antiluetic treatment tended to confirm those views of the case.

Case of Tuberculosis of Pharynx and Larynx.

By DAN McKENZIE, M.D.

THE patient is a young man, suffering from phthisis pulmonalis. There are tuberculous ulcers on the tonsils and on the posterior pharyngeal wall which are remarkably painless. The larynx is of interest in that it shows fixation of the left half.

Laryngological Section.

February 7, 1913.

Mr. T. MARK HOVELL, Vice-President of the Section, in the Chair.

Treatment of Sarcoma of the Neck (secondary to Tonsil) by Seleniol Injections.

By C. W. M. HOPE, F.R.C.S.

H. H., MALE, aged 25, came to Golden Square on September 7, 1912, with swelling of right tonsil; two months' history of enlargement. Tonsil was size of a hen's egg, hard to the feel, and had two ulcers on the anterior surface.

September 17 : Removed by enucleation *viâ* the mouth, after a preliminary laryngotomy. Microscopical report : Mixed-celled sarcoma.

November 11 : Slight induration felt beneath upper end of right sternomastoid.

December 6 : As mass was increasing, extending from base of mastoid process to upper border of thyroid cartilage, and head movements were becoming limited, it was cut down on. The whole of the tissues were indurated, and a gland was removed lying very deep in front of the transverse process of the second cervical vertebra. It was broken down and necrotic. Wound healed by first intention.

December 13 : Microscopical report : Sarcoma undergoing necrotic changes.

December 14, 17, 21, 24, and 28 : 3 c.c. of seleniol injected into the mass on each of these dates.

January 10, 1913 : The deep mass has completely gone ; only thickening present in scar, which is freely movable. Patient feels and looks very well ; has gained 5 lb. in weight in the last two weeks.

DISCUSSION.

Mr. DE SANTI said he did not think the method used in the case had done any real good. He had not tried the seleniol method, but he had

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occasionally tried other vaunted and new substances for inoperable malignant growths, such as Coley's fluid, but had not found any of them of any use at all. In the case shown by Mr. Hope the tonsil had been enucleated, and he did not see why the glands also were not removed at the same time, or shortly afterwards, whether enlarged or not. He had had eight or nine such cases, and there had been recurrence in all · of them within periods ranging from three months to four years. As a rule these cases were hopeless, and he feared this patient would go from bad to worse.

Mr. BETHAM ROBINSON did not agree with such a strict laying down of the law as Mr. de Santi had given, as there were cases of sarcoma of tonsil, clinically, which had different histological appearances ; those of the soft lymphadenomatous type did very well from the point of view of the operation. Even if the growth did recur, which was highly probable, the interval might be considerable, therefore he would not agree that such cases should not be touched. He agreed that the cases where there was much infiltration in the neck, without marked definition, were hopeless, and would rapidly recur.

Dr. BRONNER asked if any member had tried antimeristem, which had been much boomed on the Continent, particularly by Dr. Schmidt, of Cologne.

Mr. HARMER, answering Dr. Bronner's question, said that he had obtained from Dr. Schmidt material to treat a case at St. Bartholomew's Hospital of extrinsic carcinoma of the larynx. Eight to ten doses were prescribed for this patient. He had rises of temperature after each dose, and his neck was much more swollen than before. Eventually suppuration took place, and he got a fungating tumour of the neck. He believed the treatment had increased the rate of growth very materially. He understood the treatment had been used at the Cancer Hospital, but the results had not been very favourable.

Mr. HOPE, in reply, said that he did not bring the two cases forward as cured, but the first man had an enormous mass in his neck when he started to inject him, and it would have been hopeless to attempt to remove the whole mass. The mass subsided to some thickening beneath the skin incision. He started injecting him again on his second visit, and the growth was again smaller. He thought he should now have the neck opened and the glands removed. He also believed the Cancer Hospital had been using seleniol for some time, but he had been unable to find out the results.

Laryngeal Tumour treated with Seleniol.

By C. W. M. HOPE, F.R.C.S.

A. B., MALE, aged 53. Loss of voice for several months, with increasing dyspnœa. When admitted to hospital in November, 1912, had marked stridor, voice very hoarse, and could not lie down in bed.

Right arytænoid and ventricular band were replaced by a large red, smooth swelling, not mobile ; left arytænoid and cord also swollen, but much less so ; movable. Neither cord could be seen, and there was practically no glottis. Diagnosis made of swelling above a malignant ulceration. There was some definite thickening on the right side of the neck over the right ala of the thyroid, and a small, hard gland could be palpated.

As patient seemed so ill and in bad condition laryngectomy was not advised. Injections of seleniol (3 c.c.) were made three times a week into the deep tissues near the right ala of the thyroid cartilage. After the second injection patient felt great relief, all dyspnœa disappeared, and he has since been able to lie down and sleep the night through. He feels much improved generally, and looks better. Weight is stationary.

On January 15, 1913, by direct method, a large fungating mass was seen involving the right side of the epiglottis on its laryngeal surface, the right arytænoid, and extending down through the glottis.

On January 29, 1913, the fungating mass had largely disappeared, leaving a large, fairly clean ulcer, and at the lower border the cricoid ring could be felt bare.

Patient has now a much larger glottis, and the posterior part of the left cord can be seen by indirect examination.

Seleniol is an electrolytic colloid of the metal selenium, and may be injected subcutaneously, intravenously, or directly into the tumour. There is absolutely no toxic effect, and the growth is said to either absorb or liquefy.

Pedunculated Growth of Nose.

By W. H. KELSON, M.D.

THE patient, a man, aged 72, came complaining of watery discharge and difficulty in breathing through the nose. There was a pedunculated growth taking origin just below the anterior end of the right inferior turbinal.

DISCUSSION.

Dr. PEGLER said that although one could not feel sure what such a case was until examined microscopically, he thought this would prove to be a mucous hypertrophy of the inferior turbinal, with an exceptionally narrow pedicle. He commended the exhibitor for showing such an interesting

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growth before removal and hoped there would be a section of it at the next meeting.

Dr. KELSON replied that he considered the condition rare. He proposed to remove the growth, and would show a section of it at a subsequent meeting.

Syphilitic Laryngeal Stenosis with Calcification of the Fascia of the Neck.

By T. B. LAYTON, M.S.

THIS patient was formerly shown at the Laryngological Society at its fifty-first ordinary meeting on June 2, 1899,[1] and the following is copied from the proceedings of that meeting: " (Shown for Mr. Charters Symonds by Mr. Steward.) The patient, a woman, aged 32, complained of loss of voice and difficulty in breathing, and gave the following history : When a child she had an abscess on the right side of the neck, and at about the same time she became deaf. About ten years ago (i.e., in 1889) swelling and stiffness of the neck began, and this has gradually increased since that time. The present attack of hoarseness commenced three months ago. The patient is very deaf, the skin is pallid, the bridge of the nose is broad and flattened. The eyes and teeth are normal. Just behind the angle of the jaw on the right side is a large scar. The whole of the structures in the front of the neck are hard and matted. There is great thickening around the hyoid bone and thyroid and cricoid cartilages, and these structures appear to be united in a dense, hard mass. There are several enlarged glands in the submaxillary region, and lower down in the neck are several very hard nodules, one, particularly hard, being situated in the right sternomastoid muscle. The soft palate and pharynx are much scarred, and are adherent to one another. The upper opening of the larynx is red and swollen, and there is ulceration on the right ventricular band."

In the subsequent discussion Sir Felix Semon suggested that the condition might be specific, and Mr. Steward agreed. This view has since been confirmed ; firstly, because the Wassermann reaction was positive in May, 1912, and secondly, because eye lesions characteristic of syphilis have appeared in the interim. Mr. H. L. Eason examined her on January 2, 1913, and reported thus : " Patient has diffuse corneal opacity in both corneæ, in the substance of the cornea, from old interstitial keratitis, and there is extensive choroiditis in the macular region in both eyes. No evidence of iritic adhesions."

[1] *Proc. Laryng. Soc.*, Lond., 1898-99, vi, p. 107.

The impression of **Mr.** Steward is that the external condition in the neck is unchanged since he saw her thirteen years ago. The present condition differs, however, in two ways from the description given above :—

(1) The bridge of the nose is no longer " broad and flattened," suggesting that there was then active inflammation which has since become quiescent.

(2) There is now no sign of any active disease in the larynx. A proper examination cannot be made of this organ by the indirect method, because the epiglottis is curled round on itself and is nearly touching the scarred posterior wall of the pharynx. There is, however, no redness, swelling, or ulceration either of the epiglottis or of that part of the arytænoid region which can be seen. Direct examination of the larynx is impossible because the contraction of the neck prohibits a sufficient extension of the head.

She now suffers from some dyspnœa, which varies considerably from time to time. Thus she said on December 20 that it kept her awake at night-time, but by the time that she was taken into the ward for observation she was much better, and the night nurse reported that except for asking for a second pillow she had no difficulty in breathing, and slept well. Salvarsan (0˙6 grm.) was given intravenously in May, 1912, but does not seem to have made any difference to the condition. The Wassermann reaction in January, 1913, was still positive, but was less marked than in May, 1912.

Will the case progress so much as to need a tracheotomy ? and if so, is there any means of finding out whether the contraction is limited to the larynx or extends right down the trachea ?

DISCUSSION.

Mr. BETHAM ROBINSON said he saw the patient at about the same time as she was under Mr. Charters Symonds, for she was also under his care at St. Thomas's Hospital, and then there was some question as to whether it was a syphilitic case. He did not think it could now be doubted that it was syphilitic, and the positive Wassermann reaction proved it. The extreme hardness about the hyoid bone and below the jaw was much the same as fifteen years ago, but there was now more thickening about the right sternomastoid, and the nodules seemed to be in the fascia over it; the laryngeal appearances were little changed. The question arose now, as it did then, should she have tracheotomy done ? He took her into St. Thomas's Hospital for that purpose, but it was declined, and she might still decline. There seemed now to be a greater mobility of the larynx.

Mr. WAGGETT said the right arytænoid was considerably swollen, and the ventricular band was fixed. On the left side the cord was nearly fixed, but the ventricular band made active movements, indicating articular fixation.

Mr. BARWELL suggested that an X-ray photograph would clear up the question of whether it was calcification or fibrous tissue. He agreed that a good view of this larynx could be obtained by the indirect method.

Skiagram to illustrate Mr. Layton's case of calcification of the fascia of the neck.

Dr. H. J. DAVIS pointed out that in Dupuytren's contraction the bands became so hard as to suggest calcification, and the hardness in this case he did not regard as more than cicatricial, but an X-ray photograph would at once settle the matter.

Mr. LAYTON replied that if tracheotomy was suggested thirteen years ago and the patient had done without it, that was a reason for staying one's hand now. He proposed to have a skiagram taken.[1] The condition of the right arytænoid varied from time to time, and he had seen it do so during the last three or four months.

[1] This has now been done by Mr. E. W. H. Shenton. The mass in the sternomastoid throws a dense shadow, as is seen in the accompanying reproduction.

Webbing of the Vocal Cords in the Anterior Commissure due to a Shot Wound.

By John F. O'Malley, F.R.C.S.

F. M., A BOY, aged 11. Sixteen weeks ago he was standing near a brick wall with his right side towards it. His brother, who was cleaning a toy gun, which contained an " Eley 14 " cartridge, fired it off by accident against the wall close to where the patient stood. Several of the pellets ricochetted off the wall and lodged in the patient's neck. He expectorated some blood immediately, and became hoarse soon after the accident, and his voice has remained altered since then. He came into the Evelina Hospital a few days ago under the care of my colleague, Mr. Clogg, who has kindly transferred him to me. An X-ray examination shows four pellets on the right side and one on the left. The latter is opposite the transverse process of the seventh cervical vertebra, and to reach this position it must have traversed the larynx from the right side, and in doing so has damaged the vocal cords. A laryngeal examination shows the anterior third of both cords united by a web or band of connective tissue. The movements of the cords behind the adhesion, and of the arytænoids, are quite good.

DISCUSSION.

Mr. BARWELL said that some years ago he had a similar case in a man as a result of a gunshot injury in the Zulu War. He had almost the same kind of adhesion between the vocal cords. As the aperture was ample for breathing, nothing was done. That was the case here also, so he would not advise treatment from that point of view, and he did not think that there was any certainty of improving the voice by operation at the present time.

Mr. WAGGETT thought it undesirable that the boy should be allowed to grow up with such a voice. A plastic operation, after laryngo-fissure, entailed no danger, and even if unsuccessful could not leave the voice worse than it already was.

Dr. FITZGERALD POWELL did not think that an operation was indicated in this case at the boy's present age, and advised waiting until his voice had changed, and he had grown older. At the present time there was plenty of room for breathing, and though his voice was bad, there was a danger of making it much worse if he were operated on.

Dr. H. J. DAVIS would not do anything in this boy's case at present; his larynx was very small and undeveloped. But if anything were done he thought it should be through the bronchoscope by dilatation. He thought, with Dr. Powell, that the voice might be worse after such an operation as thyrotomy, which was a very crippling one.

Dr. MILLIGAN said he would operate by one or other of the methods suggested, because if left until the boy's voice was fully developed there would be considerable atrophy of muscles.

Dr. LAMBERT LACK expressed the view that operations on the larynx in children were usually failures, and it was better to defer operation until they had grown up. Not only might operation permanently impair the voice, but it might cause stricture of the larynx.

The CHAIRMAN (Mr. Mark Hovell) said his view was that it should be left for a time, to allow the larynx to develop.

Mr. O'MALLEY replied that the relatives were anxious that something should be done, but he wished to have the opinions of his colleagues first. He did think of putting him under a general anæsthetic, and with a bronchoscope taking a portion of the web away, touching the site with nitrate of silver. He thought that would make a coagulum which would last some days, and after two or three days he had intended to do a similar touching up in the hope that it would not unite across. In view of what had been said he proposed to hold his hand.

Adhesion of Uvula and Soft Palate to Posterior Pharyngeal Wall in a Girl, aged 12.

By JAMES DONELAN, M.B.

NEITHER parent nor patient has any recollection of any throat affection. Was sent to Italian Hospital by school inspector on account of imperfect nasal respiration. The father was a healthy man until two years ago, when he developed tuberculosis. He is now in an advanced stage of the disease. The mother is a healthy woman. Four healthy children older than this. No miscarriages. Patient has chronic otitis media on right side. Suggestions as to probable origin and most suitable treatment requested.

DISCUSSION.

Dr. DONELAN added that since he examined the case a fortnight ago and hooked a bent probe around the uvula it had become detached. It had also shrunk to a third of its former length.

Dr. McKENZIE asked what was the experience of members in operation for adhesions between the soft palate and the posterior pharyngeal wall. He had operated twice on such a case and found it unsuccessful. He saw a case in which Dr. Grant removed part of the bony palate and after the operation brought the uvula forward by suture and attached the suture to one of the incisor teeth; the result was the best he had seen. Another method was to put two long rubber tubes in, one through each nostril, bring them out of the mouth and attach them outside.

Mr. DE SANTI mentioned a successful case shown at the Society some years ago in which there was complete adhesion between the remains of the soft palate and the posterior wall of the pharynx. Mr. W. G. Spencer detached the adhesions with scissors and a raspatory. There was such severe hæmorrhage that transfusion was necessary, but he proceeded with the operation by turning forward on itself all the soft parts and transfixing the rolled-up soft parts with silver sutures, the ends of which were passed through the muco-periosteum of the hard palate and the stitches were left to cut their way out. There was previously no aperture between the nasopharynx and the oral pharynx, but, afterwards, a large forefinger could be passed behind. Two years later she came under him (Mr. de Santi) with complete re-contraction, but no re-adhesions, and an ordinary Eustachian catheter could not be passed up into the nasopharynx. Shortly after Mr. Spencer's case, he (the speaker) had an exactly similar case of his own and expected severe hæmorrhage, but there was no great bleeding. Though that was ten years ago re-contraction had not occurred and there was an excellent opening, and he had had three or four similarly treated since. In all of them some re-contraction had occurred but no re-adhesion, and in every case a sufficient opening was obtained for all post-nasal discharges, &c., to come down into the mouth. Some operators advocated attaching the sutures to the front teeth instead of the palatal muco-periosteum, but this was a minor detail and the credit of the operation was due to Mr. Spencer.

Mr. BETHAM ROBINSON mentioned a case shown to the Society some years ago in which he passed a bent sheet of lead round the detached soft palate, with silks at each corner, the upper silks going through each nostril and the lower through the mouth. The plate was kept in position for a fortnight, and it did very well. He had not seen the patient for several years now.

Dr. MILLIGAN said it was very difficult to prevent such cases re-adhering. He recently had a case of complete adhesion to the soft palate and had operated upon it twice. He first used a rubber drainage-tube to pull the palate forward, but the patient said he had been uncomfortable for days. In two years he came back with an aperture which would only admit a pencil. He then passed tapes of lead through the nose and round the upper lip, keeping them in situ for ten days. The result was fairly good, but he saw the patient again eighteen months ago, and though the aperture was now somewhat larger, the result was still poor.

Dr. FITZGERALD POWELL said that some years ago several of these cases were shown at the Society's meetings—he remembered Mr. Robinson's case— just about that time; he had three or four cases himself in which he had operated, and in one particularly he had an excellent result which persisted. It was the retraction of the palate which was the difficulty; it was not so difficult to prevent the adhesions.   He had used large rubber tubing with silk through the nose, which could be taken out to clean.   They were kept in for a month or two.   He thought the use of the tubing should be persisted in for a long trial to obtain a good result.

The CHAIRMAN remarked that grafting had not been referred to.   The best tissue for that purpose was a child's prepuce.   A young and popular actress came to him about nine years ago with some slight nasal obstruction, which at the most required cauterization.   A few months later she came with a considerable amount of stenosis in the nasopharynx, and inquiry revealed the fact that she had been operated upon for nasal obstruction.   The soft palate had been severely lacerated, and in consequence, except in the centre, was adherent by almost the entire length of its edge to the posterior wall of the pharynx.   Her voice was considerably affected.   Subsequently, the soft palate was separated and a portion of a child's prepuce, from which the skin had been removed, was sewn to the lower part of its edge on each side.   When seen about nine months ago there was still a very good opening and she had a fairly good voice.

Dr. DONELAN, in reply, was glad that his case, though it no longer presented the features it was desired to exhibit, had led to such a very interesting discussion.   As regards the difficulty of dealing with these adhesions after operation, he had had last year a case in which the right posterior pillar and part of soft palate were adherent to the pharyngeal wall.   After prolonged antisyphilitic treatment he had divided the adhesions and maintained the separation by extension of the patient's tooth-plate on the affected side.   This was used for nearly six months and the trouble had not recurred.   He had often thought that a special plate, curved well up behind the choana, with room in it for the folded palate, would be a very useful apparatus in such cases.

Combined Tonsillotome-tonsillectome.

By JAMES DONELAN, M.B.

THE tonsillotome is that of which the working model was shown here on November 1.[1]   In view of the present vogue of instruments with blunt blades for the purpose of enucleation in giving the instrument its definite form, it has been made more strongly and fitted with an accessory blunt blade.   When the blunt blade has been well driven

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[1] See *Proceedings*, p. 11.

home by the thumb in the ordinary way, a screw can be readily attached and the enucleation completed by a pressure, which, it is claimed, is at once greater and more under control than in Sluder's instrument. The shape of the lunette is also such that on tightening up the screw a scissors action is obtained from the closure of the angles between its edges and those of the blade. This instrument has also a sharp blade for ordinary tonsillotomy. In adding this device for the convenience of those who favour this method of enucleation the exhibitor does not wish to be understood to share their views. The tonsillectome was found to work well in the few cases in which it has been tried. The model instrument shown on November 1 is now shown again as a tonsillotome.

Dr. WATSON-WILLIAMS showed the latest pattern of his tonsillectomy forceps, an instrument which he originally devised because his thumb was too weak to use with comfort the ordinary Sluder pattern with a blunt blade. The blade being driven home by the grasp of the hand, it would readily separate the tonsil from its bed, or cut through the most fibrous tonsil if so desired. It was especially serviceable in rapidly enucleating tonsils in children under short anæsthesia by chloride of ethyl or even nitrous oxide gas.

Sluder's Guillotines.

By H. J. DAVIS, M.B.

AN account of these instruments was given at the last meeting of the Section. The exhibitor has been asked to exhibit them again, together with other instruments exhibited by others who have designed them with the same object in view—i.e., enucleation of the tonsil with the capsule intact.

DISCUSSION.

Mr. HOPE said he did not like the handle of the Sluder instrument, because it got in the way when operating. The old handle was preferable.

Mr. FAULDER said he used nothing for this purpose except the old Mackenzie instrument, with Heath's strengthening. He had done the operation about 900 times.

Mr. O'MALLEY said he did not like the slotted ring; the instrument he showed had a recess instead of a slot, and that was filled with lead. The hæmorrhage he had from the operation now averaged only three drachms.

Mr. HORSFORD said Messrs. Mayer and Meltzer had made him a modification of Heath's instrument, by making the shaft stronger and the cutting point thinner. He tried it a few days ago on half a dozen cases, and in each there was complete enucleation. That was not only the simplest method but the quickest, as they were done with one cut. Success depended on pressing the tonsil forward against the angle of the jaw.

Dr. DAN McKENZIE considered that the perfect tonsillotome had not yet been devised; there would always be modifications to suit different persons. He did not think there was anything better than the old Mackenzie instrument. When using a blunt instrument one crushed and bruised the tissues, and he considered that cutting was better as well as cleaner. He asked whether those who preferred crushing had watched their cases afterwards in respect to the cicatrization. He had seen nasty cicatrices after the procedure.

Dr. MILLIGAN said he had seen Sluder operate, and he had watched a house surgeon at one of the Boston hospitals use the snare, and he came away impressed with it; although only a junior he did the operation with great skill and finish. Sluder's method seemed somewhat brutal in respect to the force used.

Mr. WAGGETT advocated the use of the snare for enucleation. The operation was performed in a bloodless field if two snares were employed after the manner recommended by Guisez. The double operation occupied about ninety seconds, and failure to accomplish complete enucleation was very rare.

Dr. DUNDAS GRANT said that when the upper pole of the tonsil extended far up, its enucleation was considerably facilitated by means of a small incision cut through the uppermost part of the anterior pillar into the bed of the tonsil. This was best accomplished by a small rectangular knife, sharp on the edge and blunt at the tip. When this was done the upper pole was generally enucleated quite easily by means of the guillotine. The removal of this part of the tonsil was of special importance in cases of recurrent peritonsillar abscess.

Dr. KELSON asked whether it was really necessary to make the operation so easy that first-year students or nurses could be relied on to perform it. In discussing the removal of tonsils it should always be remembered that some were exceedingly easy, but others difficult, and these latter were those that chiefly interested us. The extremely rapid enucleations one sometimes heard of referred to the former.

The CHAIRMAN said he still used the Mackenzie instrument. If a tonsillotome was so thin that it bent, he would scrap it and buy a new one, as an instrument in good condition was rigid.

Serrated Adenoid Curette.

By H. J. DAVIS, M.B.

THIS instrument was designed by Dr. Leslie-Davis, of Philadelphia, U.S.A.; it is thin, flat, and very sharp, and the cutting blade is serrated in a series of curves. The exhibitor has used the instrument which was presented to him by the inventor, and when used in the way the designer intends, it answers its purpose remarkably well. The instrument is inserted behind the palate, then rotated rapidly on its vertical axis, quickly withdrawn, and the growth is removed *in toto.*

Swelling in the Right Upper Jaw in a Boy, aged 8.

By H. J. DAVIS, M.B.

THE tumour is either due to a dental cyst or a sarcoma; it has been growing steadily the last few months. The right side of the face is opaque to Heryng's transilluminator. The tumour appears to be bony in parts, and fluctuates (?) in others. The jaw-bone is expanded and the palate bulged inwardly.

DISCUSSION.

Mr. ROBINSON said there was no doubt it was a cyst. On pressing on the surface of the palate one found definite elasticity, and from the irregular condition of the teeth it was probably a dentigerous cyst with a tooth inside, rather than a dental cyst, which was usually associated with root inflammation. He did not think it was connected with the antrum.

Dr. DAVIS replied that it was now larger and denser than it was a fortnight ago. Three years ago he exhibited a similar case; it was operated upon by the house surgeon in the out-patient department, and the boy developed osteomyelitis of the jaw, and nearly died. There was always some risk that these cases might become septic when dealt with by the buccal route. The whole of that side of the face was dark on transillumination.

Mr. ROBINSON said he had removed a dentigerous cyst from a child of the same age, and in the same position, and he uttered the caution that the antrum was probably a very small one, and was overlapped in front by the cyst, and it would be easy to enter the antrum.

Dr. FITZGERALD POWELL said that as the antrum was dark on transillumination it·should be explored before an operation was done, as there might be a solid growth in the antrum and not a cyst.

Case of (?) Rodent Ulcer of Orbit.

By H. J. DAVIS, M.B.

OPERATION has been performed and the eye removed. The outer wall of the nasal cavity is freely exposed, showing the fronto-nasal duct, the ethmoid cells and the outer surface of the superior and middle turbinate bones.

The patient is a woman, aged 45, who is under the care of my colleague Mr. Bishop Harman, who performed an extensive operation on the orbit. The upper eyelid is adherent to the posterior orbital wall. The inner orbital plate has been removed, showing the strictures as above described in situ. There is no disease in the nasal cavity.

[*Note.*—March 7: The patient was operated upon a few days later. The large cavity entered was full of pus, and the disease was reported upon as tuberculous.]

Lupus of the Tongue.

By H. J. DAVIS, M.B.

PATIENT is a newspaper boy, aged 14. Both nostrils are filled with lupoid growth. The palate, pharynx, posterior nares, the epiglottis, and the skin, all show typical lupoid patches. The boy is in no inconvenience whatever, but he is very pale and looks ill.

Lupus of the tongue is rare. It is proposed to excise the granular patch on the tongue, to curette the nares, and to treat the palate and epiglottis with lactic acid, 50 per cent., and orthoform, and to give injections of tuberculin.

Dr. PETERS said the case showed the different characteristics according to the situation: Hypertrophic lupus on a moist surface, such as in this case on the palate; an almost atrophic condition when it affected a dry spot—the anterior nares in this case; and warty lupus on a thickened surface—the friction surface of the tongue.

Case for Diagnosis.

By T. Jefferson Faulder, F.R.C.S.

F. C., AGED 24. History: Swelling in the nose and of the left side of the face noticed for three years. Watering of the left eye for about the same period. No other symptoms complained of.

Present condition: Epiphora of left eye; slight fullness of the left cheek; mucous membrane in the floor of the left nostril raised by a swelling which is intensely hard.

DISCUSSION.

Mr. Jefferson Faulder added that on transillumination the left side of the face was absolutely dark; the right side nearly so. Skiagrams showed a diffuse thickening of the left superior maxilla and, to a less extent, of the right side also. Attempts made to explore the tumour with a trocar in various places through the nostril proved its extreme hardness. He did not contemplate interfering surgically with the tumour itself as it had no definite boundaries. But as the patient had permanent obstruction of the nasal duct, he seemed to be running a risk of infection of the lachrymal apparatus, and the question was whether the lachrymal sac should be removed, or whether some other way of relieving the epiphora could be found.

Mr. Robinson thought it a chronic inflammatory condition of the bone (osteo-sclerosis), spreading widely, and probably it was of the leontiasis ossea type. Iodide of potassium should be given.

Dr. Donelan regarded it as a case of old inflammatory thickening of the bone. The patient said he had had rhinorrhœa since childhood. There was a similar condition on the right side, but it had not grown up from the floor of the nose so as to obstruct the lachrymal duct. He had had a case of acute rhinitis, followed by separation of part of the intermaxillary bone. Years later there was a swelling on the other side, like that in this case. It was removed by reflecting the coverings and gouging out the bone. He thought that a good result as regarded respiration could be obtained in this instance, but it was unlikely the epiphora would be cured without dilatation or other treatment of the canaliculi.

Mr. DE Santi agreed with Mr. Robinson's view, and said he would not operate.

Dr. Pegler thought the bilateral character, as shown by examination of the opposite fossa, indicated a form of leontiasis.

Dr. Dan McKenzie suggested that the nasal duct be opened above the inferior turbinal in the outer wall of the nose, as von Eicken had advised. He hoped to show at the next meeting a case in which the result of that was fairly good.

Case of Chronic Pemphigus.

By E. A. PETERS, M.D.

MR. K. has always had difficulty with his digestion. He usually takes a milk, egg and cereal diet. There is no history of syphilis. Three years ago I removed the middle turbinals, which had been converted into a mass of polypi. Three months ago a doctor removed a small polypus with a view to relieving a non-purulent catarrh of nose and throat. This was abating when several small vesicles appeared ⅛ in. in diameter on the pharyngeal wall and, later, on the palate. Soon, however, larger vesicles were seen on the mucous membrane of the lower lip, side of the nose, lower eyelids, wrists and neck. Dr. Adamson pronounced the condition as one of chronic pemphigus. Under arsenic, rest, and small doses of opium the condition has improved, but the palate has again been attacked by large vesicles measuring ¾ in. in contradistinction to the early small blebs. A bacteriological examination revealed an occasional white staphylococcus, probably due to skin contamination.

DISCUSSION.

Dr. SCHOLEFIELD asked if the patient had been taking a drug before this condition arose. It was similar to a condition he saw follow the taking of a mixture of iodide of potassium and antipyrine; it occurred in the usual situations of pemphigus.

Dr. H. J. DAVIS recommended orthoform : he had such a case where nothing else did any good, and the insufflations not only gave marked relief to the patient's pain, but the vesicles disappeared under this treatment.

Dr. PETERS replied that he did not think the patient had been having iodide of potassium. He was not under his charge at the time when there was an operation for the removal of the polypus ; a month later small vesicles had formed on the pharynx and palate. The new vesicles became larger as the disease extended outwards. He had used orthoform when the deeper regions of the throat were affected, to relieve pain on swallowing. He would use orthoform in this case, and see if the healing could be hastened thereby.

Exhibition of Specimens from a Case of Suppuration of the Antrum due to Aspergillus fumigatus, with a short Note of the Case.

By Douglas Harmer, F.R.C.S.

(1) THREE tubes showing secretion at different stages.
(2) Tube showing growth on maltose-agar (Sabouraud's medium).
(3) Films showing mycelium.
(4) Films showing spore formation.
(5) Photographs.

Patient was a lady who had suffered for many years from hay-fever. In November, 1912, a severe cold commenced after motoring in an open car. For five weeks after there was a persistent discharge of mucus from the right side of her nose, and occasionally a thick membranous cast from the back of the throat. The latter was of brownish-yellow colour and had the appearance of wet blotting-paper. It was not offensive. She had violent attacks of sneezing and was wakened by it once or twice each night. There was never any bleeding.

On examination the right side of the nose was found completely blocked by œdematous mucous membranes. After application of cocaine and adrenalin the œdema subsided to some extent, but a good view of the nose could never be obtained. Further it was noted to vary at different times. The nose seemed to contain an inexhaustible supply of slightly yellow mucus which could not be removed by syringing. The post-nasal space was also full of mucus, and the pharynx contained a quantity of frothy saliva. The right antrum was dull.

The general health was bad, and she had the appearance of being poisoned. She complained of occasional headaches and neuralgic pains around the right eye. Her nervous system had suffered, and she could not sleep well at night. Temperature and pulse were normal. The digestion was somewhat deranged.

Under general anæsthesia an intranasal opening was made into the antrum. On washing out, no discharge was seen for a time. After about a pint of lotion had been used small lumps of brownish membrane began to appear. This continued until six pints had been employed, when the lotion again ran clear. The difficulty in dislodging the membrane was a striking feature of the case.

The material was submitted to Dr. Gordon, who reported that films stained by Gram showed a few staphylococci, and cultures on ordinary agar grew staphylococcus colonies only. In examining secretions from the upper respiratory passages, however, it is always our custom to make blood-agar plates as well, and on these there was a copious growth of *Aspergillus fumigatus* in forty-eight hours at 37° C. On re-examining the original secretion mycelium was discovered, seen best in unstained films. It was subsequently found that the fungus grew best on Sabouraud's maltose-agar. Unlike the common moulds, it can grow at body temperature as well as in the cold.

For the next month the antrum was washed out twice a day and quantities of mucus dislodged. Occasionally a few pieces of membrane appeared together with small gritty fragments like little bits of shell. Various solutions were tried, including salt, peroxide of hydrogen, permanganate of potash, and tincture of iodine, but none of them seemed effective. The peroxide, if used persistently, proved intensely irritating, even when used in five-volume strength. Injections of alcohol to 75 per cent., and a suspension of bismuth subnitrate in oil, were also tried with no better success; in fact, the patient's general condition became, if possible, worse. After four weeks' treatment, iodine was given internally, the sodium salt being employed, commencing with 2-gr. doses and rapidly increasing to twenty-three times a day. The antrum was now washed out as often as possible with five volumes peroxide of hydrogen. Forty-eight hours after commencing this treatment a great quantity of the membrane came away. From this time onwards there was never any difficulty in dislodging the discharge, which steadily lessened in quantity and grew whiter in colour. At the end of ten days all the discharge had ceased. The syringing was continued for three weeks more, when the antrum suddenly became quite clear to transillumination. By this time all the œdema had disappeared, together with the symptoms noted above. The general health rapidly improved, and the patient has now remained well for a fortnight.

DISCUSSION.

Dr. H. J. DAVIS said he had just seen a lady whom he had operated upon, and who had had some trouble in the antrum for years. The whole antrum was filled with polypi. He sent specimens to Dr. Bernstein for report, as he thought the case was malignant. Dr. Bernstein reported that the tissues

examined were not malignant, but that macroscopically and microscopically the polypi were invaded by a fungoid growth which he considered saprophytic in character.

Dr. PEGLER said he had met with this fungus in the external auditory meatus. It formed a soft mass, varying in colour from white to black, causing much pain, and perforating the drum membrane.

Dr. BRONNER said that this was a fairly common affection of the external auditory meatus and often overlooked. Was it possible that the patient referred to had infected the nares from the ear by the finger-nails?

Mr. WAGGETT reported a case in which, some five months after a successful radical operation upon the maxillary antrum, the patient returned with that cavity completely filled with a dark green, firm, leathery mass. This was removed with considerable difficulty, and proved to consist of the mycelium and hyphæ of a fungus. The exact species for the moment escaped the memory of the speaker. The patient, a man, aged 40, reported that serious nasal symptoms appeared shortly after an occasion on which he had worked upon some mouldy hay in a barn.

Mr. HARMER replied that he could find only three other cases recorded in the literature in which the disease was in the antrum. It was more common in old abscess cavities in the lung and in the ear, but apparently in the nose it was rare. This patient never had anything the matter with her ears.

Specimens of Artemia salina from the Nose (a New Form of Sea Serpent).

By DOUGLAS HARMER, F.R.C.S.

A LADY who had suffered for many years from rhinitis had been in the habit of using douches of various kinds. Recently she had used a solution of a patent sea salt which had been recommended by a friend, as it was said to possess special healing properties. After the use of this lotion she noticed intense irritation in her nose on several occasions, accompanied by attacks of sneezing. She became convinced that something was creeping about inside her nose, and on washing it out discovered the two sea monsters shown. She was anxious to know whether they were common inhabitants of this region.

At first sight it seemed improbable that they ever came out of the nose at all, but the patient was sure of the fact. The history was so remarkable that the specimens were sent to Dr. S. F. Harmer at the

Natural History Museum, who was able to confirm her diagnosis. He reported as follows :—

" Some months ago it was accidentally noticed, in the Botanical Department of this Museum, that a solution of this sea salt, left to itself for some weeks, became tenanted by a very interesting crustacean, *Artemia salina*. The experiment was repeated in the Zoological Department by Dr. W. T. Calman, with the same result. Dr. Calman published a note on the subject in *Knowledge* for June, 1911. The culture which he started on May 9 is still in existence five months later, and has reached the second generation. The cold weather will, however, probably kill off the survivors. *Artemia salina* is well known as an inhabitant of brine pools, where it flourishes when the salt has reached a high degree of concentration. I presume that during the preparation of this salt some of the eggs get dried off with the salt and remain capable of developing when they are put into water under suitable conditions. You may confidently express the view that your patient's theory of the origin of the artemia was a correct one. Dr. Calman points out that one of the specimens carries eggs, and that the solutions used would thus appear to have been some weeks old."

Dr. DAN MCKENZIE considered it showed great diagnostic acumen to have discovered this monster in the discharge, and to have traced it to its lair.

Ulceration of Pharynx and Larynx.

By HAROLD BARWELL, F.R.C.S.

BOY, aged 13 ; aphonia three years, no dysphagia. Extensive ulceration of pharynx, larynx and nasopharynx ; soft palate and epiglottis largely destroyed.

Mr. BARWELL added that the Wassermann test was found to be positive, and this cleared up the diagnosis. He considered it very difficult to distinguish the nature of the chronic granuloma causing the ulceration in these cases, and he doubted whether one could make a diagnosis solely by inspection.

Laryngological Section.

March 7, 1913.

Mr. HERBERT TILLEY, President of the Section, in the Chair.

Larynx removed (Post Mortem) from a Man who had worn a Tracheotomy Tube for Eighteen Years.

By HERBERT TILLEY, F.R.C.S.

E. P., AGED 58, a short and spare man, consulted me some eighteen years ago for difficulty in breathing. This was of an urgent nature, especially on slight exertion. Laryngoscopic examination showed the vocal cords in the adducted position, and some fullness of the arytænoid regions. No lesion was discovered in the chest nor in the central nervous system. His general health was good. Tracheotomy was performed under local anæsthesia, and for eighteen years the patient did his work satisfactorily. He has been twice shown at the Laryngological Society or Section, and no one has been able to throw any light on the nature of the original lesion in the larynx. Last month he died of "blood poisoning," and I was only able to secure the larynx.

I am indebted to Mr. T. W. P. Lawrence, the Curator of the Museum in University College Hospital Medical School, for the following description of the larynx :—

"The larynx shows mal-development of the cricoid and left arytænoid; the latter is only about half the usual size. The posterior lamina of the cricoid is very narrow transversely, and has a big fissure in the mid-line, which is filled up with membrane continuous with that of the trachea. From the narrowing of the posterior lamina there

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ERRATUM.—In the last number, p. 88, the title of Dr. Davis's case should be " Case of Rodent Ulcer of Orbit," the query having been inserted in error. The *Note* at the foot of the case was also inserted in error ; it should have been placed after the previous case, that of "Swelling in the Right Upper Jaw" on p. 87.

A—17

results a falling together of the alæ of the thyroid, and the angle they form anteriorly is very acute. The entire right half of the cricoid is less developed than the left; as a consequence, the right arytænoid is placed more forward than the left, and the epiglottis tilts downwards and to the right. The arytænoid cartilages are very vertical, and their mesial surfaces in contact, but the narrowing of the rima appears to depend more on the falling together of the alæ of the thyroid. The crico-arytænoid joints appear to be normal."

DISCUSSION.

The PRESIDENT (Mr. Herbert Tilley) said the conditions of the larynx were very rare, and he doubted whether there was a record of anything like it in the literature of laryngology. Curiously, another patient came to him (the speaker) within three weeks of the one from whom this specimen was obtained and with identical symptoms, and this patient was still alive and suffered no inconvenience beyond that due to the tracheotomy tube which he had worn for eighteen years.

Sir FELIX SEMON said he had never seen anything like the present case, and he doubted whether an exactly similar one had ever been described. He once had to write a chapter on malformations of the larynx and went through the literature for the purpose, but did not remember anything of this kind. Twenty years ago, however, he showed at the Clinical Society of London a curious case of congenital malformation of the larynx and trachea, with a diverticulum of the œsophagus, occurring in a young woman.[1] In that case the thyroid cartilage was more prominent than usual in women, and it was found, on palpating the larynx, that the two halves of the thyroid were not united in front by cartilaginous union, but merely by a firm ligamentous connexion. The record stated that the finger-tip could be easily introduced into the fissure resulting, and the right half of the thyroid distinctly overlapped the left. The laryngological examination showed a striking picture, the right half being higher than the left, and a remarkable feature was that one could look right down into the right ventricle of Morgagni, and that the right vocal cord was visible along its entire breadth. He would ask every member of the Section, when they came across cases of malformation of the larynx, not to allow them to pass unrecorded and unexhibited. It was most desirable that they should find a place in the literature of their speciality. At present their number was quite small.

Dr. W. HILL assumed that Mr. Tilley regarded the condition as a congenital malformation, and not merely the result of disuse or of inflammation, though the notes contained no definite statement in that sense.

[1] See *Trans. Clin. Soc. Lond.*, 1892, xxv, p. 298.

The PRESIDENT replied that he did not know exactly how to explain the relationship between the symptoms and the laryngeal condition. It was difficult to understand that a man should have lived for the time this patient had—he came under notice when aged 40—without trouble, and then suddenly develop symptoms. He remembered him coming to the London Throat Hospital with considerable œdema of both arytænoid cartilages. It was obvious that the man required a prompt tracheotomy, and this was done under local anæsthesia. The mal-development of the larynx was probably congenital, and some inflammatory conditions arose leading to the necessity for tracheotomy. There was no history of traumatism.

Killian's Apparatus for Suspension Laryngoscopy.

By WALTER HOWARTH, F.R.C.S.

BY the use of this apparatus an admirable view is obtained of the larynx and of the deep pharynx. It possesses several points of advantage over the ordinary direct method, the principal ones being that the field is considerably larger and that the surgeon has both hands free.

DISCUSSION.

Dr. BROWN KELLY said he had used the apparatus for papilloma, lupus, and tuberculosis, and to obtain a good view of the post-cricoid region. It not only gave a very extensive view, but also allowed one to get nearer the parts. The chief consideration was that it enabled the most delicate operations in the larynx to be carried out by those who had never used the laryngeal mirror.

Dr. WILLIAM HILL said that he had tried Killian's suspension apparatus in a case where he wished to remove a growth near the anterior commissure, and in order that the instrument might be inserted in the correct manner to get the best available view, he had got Mr. Davis, who had had considerable experience with this method, to come and insert the spatula. Unfortunately the method failed just in the class of case where it promised to have advantages over the ordinary hand instrument. Mr. Davis found that in this case, as in many of the others that he had examined, it was not possible to get a view of the anterior third of the glottic region. He (Dr. Hill) then inserted his large slotted direct laryngoscope manipulated by hand, and there was not the smallest difficulty in maintaining a prolonged exposure of the anterior commissure. Such an experience naturally did not impress him very favourably with the scope of this new method. It was, of course, a great advantage to avoid the strain on the left hand in the ordinary method which during prolonged operations sometimes brought on temporary cramp, and if one were called on to employ

it frequently he would not be surprised if it produced an occupation neurosis. Brünings's counter-pressure attachment, however, was brought forward to avoid this, and it possessed the same advantage as the suspension apparatus, in that it left both hands free if necessary. No doubt this new apparatus gave a splendid field of view for operations in the arytænoid region and pyriform fossæ, but it seemed to have a limited field of usefulness and failed in just those cases where it was most wanted. He had recently been shown by Down Bros. a modification in the attachment of the spatula so that the pull could be adjusted and made to act nearer the distal extremity of the spatula, but he had not as yet tried this pattern, which he was told had been employed at Guy's Hospital, and he rather gathered that it originated in the Throat Department at that institution. He believed that improvements in this apparatus would be made in the near future so as to increase its field of usefulness, more especially in bringing well into view the anterior commissure in all cases. It would be interesting to know if others had been more fortunate or whether they had experienced similar disappointments to his own in difficult cases.

Mr. EDWARD DAVIS said that the case referred to by Dr. Hill was a difficult one, and the man had a small mouth. He was a syphilitic patient, with stenosis of the larynx, and one could not see more than the arytænoid cartilages and a very small part of the vocal cords. He believed Mr. Howarth would show an apparatus in which there was a method of pressing the larynx backwards into the pharynx, enabling a better view to be obtained of the anterior portion of the cords. So far he had not obtained a good view of the anterior commissure. He understood that Killian, in his writings, admitted that in his earlier cases he could not obtain a good view of the anterior commissure, even when the larynx was pressed backwards into the pharynx.

Mr. LAYTON said they had not yet introduced modifications of the instrument at Guy's Hospital. Their instrument came from the same firm as that of Mr. Howarth. The apparatus might be made to fit on the left side of the table, as at present the upright was in the way if any external operative treatment became necessary. This was well brought out in the case of a girl upon whom he operated quite recently for papilloma, necessitating a hurried tracheotomy.

The PRESIDENT said he had not used the instrument, but he hoped it would enable one to see the anterior commissure. It was just the anterior third of the cords which was so difficult to operate on by either the indirect or the direct method. He thought with Dr. Hill that with the direct tube and the patient's head a little bent forward, or with someone pressing up the larynx, an excellent view of the anterior commissure could be obtained. Hence, he had not yet met with the necessity for the suspension apparatus, but assumed that it would relieve the strain on the operator's left arm, which was a very real trouble, especially in a muscular patient, and this might occur even when he was deeply under an anæsthetic.

Sir FELIX SEMON said Killian looked at it from the point of view of the importance of being able to use *both* hands, and the operator was not encumbered as in the case of the direct or the indirect method, by having his left hand engaged in holding either the mirror or the handle of the tube during the whole of the contemplated operation.

Mr. WAGGETT found the instrument especially valuable in the examination of the hypopharynx and pyriform fossæ.

Mr. HOWARTH said that at present his experience with the instrument was not great. It seemed to him to have some mechanical defects, and the instrument makers were collaborating with him in introducing some modifications which he hoped would prove advantageous. He had not been able to see the anterior commissure in all cases, but by the use of modified spatulæ and the counter-pressor suggested by Albrecht the anterior ends of the cords could usually be seen. He had, however, recently had a case of a very muscular subject where the anterior commissure was not seen until the ordinary direct method was used. The chief advantage of the apparatus was the wide and free view to be obtained of the posterior and lateral parts of the larynx, and of the deeper parts of the pharynx. He thought that the advantage of having both hands free was one which was not to be despised.

Piece of Broken Tracheotomy Tube removed from the Right Bronchus.

By WALTER HOWARTH, F.R.C.S.

THE patient came up to hospital and asked for a new tracheotomy tube. It was noticed that his old one was broken, and as he had some cough and blood-stained expectoration an X-ray photograph was taken. The specimen was removed under cocaine anæsthesia.

Papilloma of Soft Palate.

By WALTER HOWARTH, F.R.C.S.

THIS case was shown at the December meeting after a large fibroma had been removed from the soft palate.[1] The present condition had arisen since that date. It was interesting to note that a small papilloma had been removed from the base of the uvula last July.

[1] *Proceedings*, p. 37.

DISCUSSION.

Mr. BARWELL doubted the diagnosis of papilloma, though from one inspection he would not be too dogmatic. The growth seemed to be very massive, and to be infiltrating the tissues, and he thought that it would prove to be malignant.

Dr. LOGAN TURNER said he also considered the condition might be malignant, though the question of tuberculosis entered his mind. It was, however, rather rapid for tuberculous disease.

Dr. BROWN KELLY also doubted whether it was papilloma. Last session Mr. Lack[1] showed a case of so-called papilloma of the palate in which there was a similar doubt. Histologically it proved to be papilloma, although clinically it seemed to be malignant.

Mr. HOWARTH, in reply, said that the diagnosis was made from the clinical appearance, he had only seen the patient that day and had not time to have a microscopic examination made. In reply to Dr. McKenzie, he said that he had submitted sections of the previous tumour to Mr. Shattock who pronounced the growth a fibroma. He proposed to remove the present tumour and would bring microscopic sections to a future meeting.

Laryngectomy subsequent to Tracheotomy for Epithelioma of the Larynx.

By DAN McKENZIE, M.D.

THE patient is a male, aged 52. Laryngectomy was performed seven weeks ago. The interest in the case from the operative point of view lies in the fact that tracheotomy had been performed a fortnight before the larynx was removed. Thus the typical operation with the suturing of the whole tracheal margin to the skin could not be readily adopted. However, in order to avoid the dangers of an open trachea in the lower part of the neck wound, the upper end of the trachea was closed by catgut sutures, the lower margins of the lateral skin and flaps were sutured to the posterior margin of the trachea, and the whole, or nearly the whole, of the lower transverse incision was left open and packed lightly with gauze. The result was satisfactory. By the time (ten days after operation) the tracheal sutures had given way and the upper end of the trachea began to gape, the upper part of the wound

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[1] *Proceedings*, 1912, v, p. 14.

had become isolated from the lower. By these means the pharyngeal discharges were prevented from reaching the trachea during the whole course of the convalescence.

The wounds have healed with little or no inflammatory reaction (excepting a stitch abscess in front), and this I ascribe to the facts that all the teeth were removed (the patient was the subject of pyorrhœa), and that the feeding tube was kept in the œsophagus for sixteen days.

Respiration is now effected through the upper end of the trachea. The original tracheotomy wound has been allowed to close, but the patient still wears a rubber tube in the upper end of the trachea.

The specimen of the larynx removed from the above case shows the growth extending vertically from the middle of the left ventricular band to the level of the cricoid cartilage, and involving the left side of the larynx chiefly. Diagnosis of epithelioma before operation by microscopic examination (Dr. Wyatt Wingrave).

DISCUSSION.

Sir StCLAIR THOMSON said that from examination of the specimen it was clear that laryngo-fissure would not have got beyond the disease without scooping out the soft parts on both sides to such an extent as to produce practical stenosis. It was a most suitable case for laryngectomy—too far advanced for laryngo-fissure, and not too extensive for excision of the larynx. But Dr. McKenzie, in removing it, did not split the larynx first. No harm had come from that in this particular case, but it would be well for those beginning this work to be advised beforehand to split it first and look inside, for he had known more than one case which, after removal, turned out to be syphilitic and not malignant. Another reason was that in a case he had recently, he fully intended to do laryngectomy, but he afterwards congratulated himself on having split the larynx, because although at first it looked a most suitable case in regard to the larynx proper, he found the disease had spread below the cricoid on to the first two rings of the trachea, and invaded the partition between the trachea and the œsophagus, and so the case was useless for laryngectomy. He therefore closed it up, and simply left in a tracheotomy tube.

Dr. D. R. PATERSON agreed with Sir StClair Thomson's remarks about splitting the larynx. He had a similar case in which he found that the back wall over the cricoid was very considerably affected. He finished the operation there, and put in a tracheotomy tube, and the patient was still alive and had very fair comfort. But if he had gone on, the removal would neccesitate extensive dissection, and he did not think the patient would now be alive. Another point was that in those cases calling for laryngectomy in which the patient had a short neck, the plan adopted by Dr. McKenzie of putting in a

tracheotomy tube for ten days was admirable, because it fixed the trachea to the skin wound much better. There was a great tendency for the trachea in short-necked people to retract.

Dr. BRONNER said that some years ago he saw a case in which a patient had had tracheotomy performed, and it was intended to remove the larynx. He saw a big growth which he regarded as carcinoma entering the larynx; the growth, however, was growing from the posterior wall of the pharynx, and had covered the glottis, so that the patient could not breathe properly. The larynx, however, was found to be normal.

Dr. DAN McKENZIE, in reply, said he was much interested in the remarks made in regard to splitting the larynx, but while it was true that splitting the larynx enabled one to see the extent of the growth, it was possible to imagine that one might be deterred, in certain cases, from proceeding to laryngectomy after splitting the larynx by a fear that the growth had extended beyond a point from which it could well be removed by laryngectomy. As time went on bolder measures were attaining success, and he thought that if one adopted a radical attitude in those cases, that was the line along which progress would be made. In this case he had formed no plan in advance, but took things as they came, proceeding by a more or less intelligent opportunism. The question of syphilis had been settled before operation. He wished to express his thanks to Mr. E. Waggett for many valuable hints regarding the after-treatment.

Cystic Distension of the Lachrymal Sac ; Operation on Nasal Duct in the Nose (West's Operation).

By DAN McKENZIE, M.D.

THE patient is a woman, aged 32. She has been suffering from ethmoiditis for some years. Four months ago, after the removal of polypi from the left side of the nose, she noticed a swelling at the inner canthus of the left eye. The swelling corresponded in situation with the lachrymal sac. It was tense and fluctuating, and could be emptied into the nose by steadily pressing upon it.

On November 28, 1912, West's operation was performed. A flap of mucous membrane, with the base posteriorly, was raised from the lateral wall of the nose at a level between and in front of the anterior ends of the middle and inferior turbinals. With a gouge the naso-lachrymal bony canal was broken into and the membranous nasal duct exposed. The nasal duct was then opened up as high as the lachrymal sac. Lachrymal probes, which formerly met with obstruction in their route towards the inferior meatus, now passed freely into the middle meatus. So far there has been no return of the swelling.

DISCUSSION.

Dr. D. R. PATERSON said he was not clear as to what had been done here. In von Eicken's[1] operation one had to get the lachrymal sac through the antrum. Probably Dr. McKenzie did West's operation. In this the speaker's difficulty had been to keep the opening patent, as in nearly all artifical openings there was a tendency to stenosis later. What had deterred him, however, latterly from proceeding with this operation in some cases was that he saw a case reported where the person had some difficulty in blowing the nose, for when he attempted it he blew air through the lachrymal sac and duct and he had to hold pressure on the corner of his eye to prevent it. In one case where there was a good deal of disease round the sac and in the ethmoid cells he had removed the sac; and in that and another case the result was excellent. Beyond a little watering when exposed to a cold wind, there was practically no discomfort resulting. A colleague had done Toti's operation of establishing a communication with the interior of the nose by stitching the mucous membrane of the sac to the nasal mucosa six times, three of which had been successful, but there also the difficulty was to keep the opening patent.

Dr. DAN MCKENZIE replied that he had shown the case in order that the operation might be tried more extensively. The results had been as Dr. Paterson stated: there were both successes and failures.

Brain, with large Pituitary Tumour, from Patient who died from Hæmorrhage after Partial Removal of Floor of Sella Turcica.

By W. HILL, M.D.

WOMAN, aged 32. Was sent by Dr. Leonard Williams to St. Mary's Hospital for the operation of decompression of pituitary region. She was of massive build and presented marked external signs of acromegaly in skull, face, limbs, &c. The skiagram showed great enlargement and flattening of the pituitary fossa with double outline. There was bitemporal hemianopsia. She suffered from drowsiness and marked mental hebetude. A large goitre was present.

A portion of the floor of the pituitary fossa was perforated with a mastoid hand burr of medium size after the sphenoidal sinuses had been opened (and their septum removed) through a tunnel made by submucous resection of the nasal septum; a Killian incision only was employed and

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[1] Dr. McKenzie had misnamed the operation in the original notes.

made on the right side of the septum. On withdrawal of the burr after it had sunk into the fossa mainly through the roof of the larger right sphenoidal sinus there was a very free flow of venous blood, which was stopped by plugging with gauze dipped in adrenalin solution. On removing the plug a few minutes later the oozing was slight and soon almost stopped. A large fresh marine sponge was inserted in the nasopharynx, but the sphenoidal sinuses were not plugged, as it was decided after consultation with Dr. Williams and Mr. Graham that even continuous oozing was preferable to damming up blood in the cranial cavity and so increasing intracranial pressure. A severe hæmorrhage, unfortunately, occurred two hours later, and the loss was so great that the sphenoidal sinus was lightly plugged with gauze soaked in peroxide of hydrogen. As a good deal of hæmorrhage came on again later, and the pulse was bad, firmer plugging was resorted to and bleeding arrested, but the patient's condition became gradually worse with marked collapse and syncope, evidently the result of increased intracranial pressure, and she died eight hours after operation.

Post-mortem: The convolutions on the vertex were flattened and the pituitary fossa was found to be of enormous size, filled with a soft, apparently malignant growth into which hæmorrhage had taken place; the tumour, after emerging from the large ring in the dura mater, expanded to the size of a Victoria plum and merged in the base of the brain; its thin capsule was bulged anteriorly and to the right by a large hæmatoma. There was no blood anywhere in the subdural or subarachnoid spaces, but there was an excess of cerebrospinal fluid. The unperforated part of the floor of the sella was bare and eroded, and showed no trace of dura mater. The right cavernous sinus was apparently intact, but the operation hole was close to it and possibly a rotten vein leading from it to the opposite sinus was opened by the burr, or the bleeding may have been from the tumour itself.

The case was, as it turned out, quite unsuitable for operative interference, and well illustrates the dilemma with which one is confronted when severe bleeding ensues in pituitary fossa operations.

[The diagrams and table of operative methods previously exhibited at the discussion on Pituitary Disease held at the combined meeting of the Sections of Neurology and Ophthalmology on March 5 and 12 (the report will be published in the next number of the *Proceedings*) were also shown].

DISCUSSION.

Dr. W. HILL added that in this case there was no protecting dura mater present, and that probably explained the tremendous hæmorrhage when the burr perforated the sellar floor. His view was that the purely endo-nasal Killian-Hirsch operation was not always the best. There was in the woman he was speaking of a condition specially favourable for that operation, however, in that she was an acromegalic and her anterior nares were very large, and there was no absolute necessity to resort to Mr. Graham's auxiliary incisions of either splitting the end of the nose or of slitting up one nostril. In an ordinary case, however, he would enlarge the anterior narial opening forwards and upwards, to get a wider proximal opening, as Mr. Graham had done in his second operation. If a general surgeon undertook a pituitary decompression it would be better for him to choose the Ollier or the v. Bruns operation of displacement of the external nose, because that would bring him an inch nearer to the floor of the pituitary fossa. For a rhinologist, however, there were no inherent difficulties connected with the Killian-Hirsch endo-nasal approach apart from hæmorrhage in acromegalic subjects. With increased experience one would probably come to look upon it as a fairly easy operation, but a large tunnel must be made so that one could touch the sellar protrusion with the finger. One must not resect too near the roof of the sphenoidal sinus, as there would be danger of wounding the optic chiasma—the real bugbear of these operations. The cavernous sinuses could be avoided by keeping to the middle line, but one must take one's chance as regards finding large inter-sinus veins, a very vascular malignant tumour, and absence of dura mater, a combination encountered in this instance and in several other recorded cases which had succumbed to hæmorrhage.

Mr. GRAHAM said he had been struck with the advantage of splitting the nose instead of working through the nostril. He advised the surgeon who contemplated the operation not to attempt it through the nostril unless he first split the vestibule. And that splitting should be started by the median incision. Another disadvantage of the Hirsch operation was that the columella was there the whole time, and that caused a deviation of the instrument from the middle line. His incision to the tip of the nose only could be enlarged upwards if necessary, and then one would be brought almost as close to the tumour as by any other method. He had used peroxide of hydrogen for a considerable time, but did not believe much in it. Pressure was, in his view, better ; nothing for bleeding in the sella turcica excelled plugging with sterilized gauze straight on to the spot, as one would plug any bone cavity.

Mr. WAGGETT said the Section should feel indebted to Dr. Hill and Mr. Graham for bringing forward their cases, which served to illustrate the fact that whereas the operative technique formed an interesting and tempting branch of nasal surgery, the general subject of pituitary disease was still in its infancy. At the present time it was not even known how much of the gland

could be removed without producing infantilism. It was to be hoped that at the International Congress in August the literature would be brought up to date.

Mr. PIKE said that five years ago in Vienna he saw Professor Eiselsberg do an operation on such a case in a woman ; Professor Tandler, the Professor of Anatomy, devised the operation first on the cadaver, and was present at the operation, as also was the radiographer. The head of the patient was lying over the end of the table, in the surgeon's lap, and he operated through the nose.

Mr. O'MALLEY said that when in Vienna he had seen Hirsch do one of his cases, and there were certain features of the technique which struck him at the time as being somewhat extraordinary. The operation was performed in the out-patient department of the ear clinic at the Allgemeine Krankenhaus, under local anæsthesia, and the patient sitting upright on a stool. The septal route indicated by Dr. William Hill in the diagrams shown that day was the one adopted. It was done with biting forceps; he did not see a chisel used. Soft adenomatous material was taken away, and the patient was sent back to the ward. Three weeks later the patient seemed to be doing well. There was not more hæmorrhage than one saw in submucous resections.

Case of Pituitary Growth.

By C. I. GRAHAM, F.R.C.S.

S. P., AGED 43, is under the care of Dr. Wilfred Harris for failing eyesight of six years' duration, giddiness and frontal headaches, dull and heavy in appearance, but answers quickly and intelligently ; amenorrhœa thirteen years; none of the usual external signs of acromegaly. She is unable to read, write, or sew, and can only distinguish faces of persons close to her. Her field of vision, left eye for white, has definitely contracted since 1907, while the right eye is blind, except for large white objects in upper nasal field. The left pupil reacts well to light thrown in any direction; the right pupil reacts badly to light. She has right optic atrophy and left optic neuritis. There is ptosis of both eyes. On February 2, 1913, 8 oz. of glucose were administered by mouth; 42 oz. of urine were collected in the succeeding twenty-four hours, which showed no trace of sugar, the specific gravity being 1020. Skiagram shows enlargement of sella turcica with apparent erosion of dorsum sellæ.

The exhibitor intends to perform a decompressive operation by the nasal route when the mouth is in a more healthy condition.

Specimen of Cerebral Tumour which involved Pituitary Fossa ; Microscopical Section.

By C. I. GRAHAM, F.R.C.S.

THE case was shown at the meeting of the Section on January 10, 1913,[1] after operation on November 27, 1912. A second operation was performed on January 29, 1913, because of recurrence of marked drowsiness and headaches.

Because some difficulty in separating the muco-perichrondial flaps made by the previous operation was anticipated, it was decided to approach the pituitary fossa by way of the left nasal fossa proper; therefore the ventricle of the left vestibule was laid open by an incision ½ in. in length, which began at the opening of the naris and terminated at the tip of the nose. Next the left middle turbinal was reduced in size, and after a few drops of blood were removed on wool pledgets, a vertical incision was made in the mucous membrane which had previously covered the front wall of the sphenoidal sinus. When the mucous membrane was separated laterally, some difficulty was experienced in distinguishing the dura from the adjacent bone; after defining the opening into the fossa by means of a probe, more bone was removed by means of a $\frac{5}{8}$-in. burr. Then the dura was removed by Luc's forceps and the fossa explored. A piece of growth was removed the size of half a walnut which appeared to be of a papillomatous nature. The patient bore the operation very well and next day was well enough to be moved to another ward in the hospital, but the same night, thirty hours after operation, suddenly collapsed.

Post-mortem : Cerebral convolutions flattened. An encapsulated growth the size of a small golf-ball was found in the position of the infundibulum in the floor of the third ventricle, distorting the optic tracts and raising the basal ganglia. There was a breach in the capsule of the growth where it lay over the pituitary fossa : the fossa contained a markedly compressed pituitary gland but no growth was found in the fossa. The entire floor of the fossa, which was very large, had been removed, the boundaries of the opening being the cavernous sinuses laterally, the olivary eminence anteriorly, and the dorsum sellæ

[1] See *Proceedings*, p. 61.

posteriorly. There was no effusion of blood, nor was there any evidence of sepsis.

Provisional diagnosis of perithelioma by microscopic examination (Dr. Spilsbury).

Extensive Granuloma of the Larynx in a probable Case of Early Phthisis.

By T. JEFFERSON FAULDER, F.R.C.S.

MR. H. P., aged 21, was well until the spring 1912, when he had a " cold " and loss of voice ; recovered more or less completely ; again had a " cold " in December followed by loss of voice.

January, 1913 : Voice reduced to a hoarse whisper ; nasal cavities very wide ; tongue furred and swollen ; pharynx, larynx, and trachea intensely inflamed ; in the inter-arytænoid space a tumour, like a papillomatous growth, preventing adduction of the cords ; no dysphagia ; no sputum or night sweats ; no loss of weight or appetite.

February 2 : Inflammation has subsided ; voice still lost ; cords cannot be adducted posteriorly. There are practically no physical signs in the chest, but the physician's opinion is that the case is one of very early phthisis.

Opinions are invited as to whether this is a case of tuberculous granuloma or simple papilloma of the larynx, and in either case as to what treatment should be adopted.

DISCUSSION.

Mr. JEFFERSON FAULDER added that Dr. Woodwark had seen the case three or four times, and gave it as his definite opinion that there was early phthisis at both apices, though the von Pirquet test gave no result.

Mr. BARWELL said the patient had an inter-arytænoid swelling, with some infiltration of the vocal cords, such as he had always associated with tuberculous laryngitis. The treatment depended on the patient's general condition of health, and the progress of his lung condition. The patient should be kept under careful observation for two or three weeks, and the temperature, weight, &c., carefully noted before the question of operation was entertained. If the general condition of the patient should be satisfactory, the outgrowth in the inter-arytænoid space could be removed.

A Cartilage of the Septum Nasi removed by Operation and showing a Circular Defect.

By T. Jefferson Faulder, F.R.C.S.

The mucous membrane on both sides of the septum was intact, but that on the wide side showed slight atrophy. The patient was a female, aged 23, a draper's assistant. The septum has healed satisfactorily.

DISCUSSION.

Mr. Jefferson Faulder said that the case illustrated one of the difficulties in doing submucous resection. He did not know what was the explanation of the aperture in the cartilage. His instrument slipped through to the other side, after which he could see the perforation and avoid it. In a small way this case reminded him of one which he had reported, where a partial resection had been done previously with an incision too far back. He began his operation not knowing that part of the septum had been removed before, and everything went well until he arrived at the gap in the cartilage. It was possible to separate the flaps again after a period of five years.

Dr. Dan McKenzie said that two or three years ago he showed before the Section two specimens of a fenestrated cartilage removed by resection.[1] The genesis of those cases was very interesting. He believed the holes in the cartilage were due to deposits on both sides of the septal mucous membrane of mucus which, on drying, produced pressure atrophy of the underlying cartilage. He suggested that perforation of the septum was due to the presence of one of these fenestræ in the cartilage prior to the perforation of the membrane. He had been looking for many years for the typical classical case of acute perforating ulcer of the septum, but had not yet seen it. This pressure atrophy would not affect the bone, only the cartilage, since the former contained an intra-osseous blood supply, while the latter was nourished solely from its surface.

Dr. W. Hill said it was not uncommon in children to see a hæmatoma which had suppurated, and he had never incised such an one without finding a hole in the cartilage. A former suppurating hæmatoma was probably the explanation in some cases of a perforation of the cartilage but with intact mucosa.

[1] *Proccedings*, 1911, iv, p. 5.

A Post-mortem Specimen of Laryngeal Tuberculosis.

By E. D. Davis, F.R.C.S.

The specimen was obtained from a male patient, aged 38, admitted to Mount Vernon Hospital with advanced laryngeal tuberculosis, and with chronic pulmonary tuberculosis of the apex and pleura of the right lung. Death was caused by diffuse tuberculosis, with cavity formation of the right lung, and recent miliary tuberculosis of the left lung.

Patient was first seen in August, 1912, and a sketch of the condition of the larynx at that time is shown. He was treated by cautery puncture, rest, insufflation, &c., with little relief or benefit.

October : Epiglottis amputated with punch forceps (specimen shown). Patient was considerably relieved (?), wound healed within a week and did not cause any pain or dysphagia; ulceration of the base of the tongue and left ventricular band, and arytænoid curetted with Heryng's curettes both by the indirect method and by suspension laryngoscopy. The ulceration of the base of the tongue healed, and the ventricular band improved. At this point the patient appeared to be gaining ground, and tuberculin (B.E. $\frac{1}{50000}$ mgr.) injections were given with marked reaction, fresh sloughy ulceration, and definite retrogression of the patient. The patient suffered considerable pain, which was only slightly relieved by cautery puncture, curetting, and other remedies, but was almost completely abolished by the injection of eucaine and alcohol into the left internal laryngeal nerve and subsequently into the right nerve. After this injection, he gained $3\frac{1}{2}$ lb. in one week, and improved rapidly.

At the end of January, when the larynx was doing well, an exacerbation of the lung condition occurred, from which he died on February 17.

The vigorous treatment of the larynx relieved the pain and discomfort, and prolonged life.

Wassermann reaction and sputum negative. ·

Amputation of the Epiglottis for Tuberculous Ulceration.

By E. D. Davis, F.R.C.S.

A male patient, E., with a long history of laryngeal and pulmonary tuberculosis. The epiglottic ulceration had been cauterized and curetted with no improvement. Amputation with punch forceps on February 5, 1913. Rapid healing of wound. Patient is receiving tuberculin B.E. 1 mgr.

DISCUSSION.

The President said he supposed all members had amputated the epiglottis, and probably with great relief when it was done for extreme pain on swallowing. But few were able to find out what happened to the cases afterwards, for they drifted away, and perhaps had a recurrence of symptoms. It was valuable to hear the later history of these cases, for they should make the operator careful in promising too much from the point of view of cure.

Mr. Barwell said he had amputated a number of epiglottides at the Mount Vernon Hospital, but they nearly all went to the bad eventually, because there was seldom extensive tuberculous involvement of the epiglottis until advanced tubercle was manifested elsewhere. It was only occasionally that one met with epiglottic disease in which the rest of the larynx was more or less healthy. He had had only two cases in which the larynx became completely healed after amputation of the epiglottis. One died eighteen months later of sudden hæmoptysis, but the larynx had remained well during that time. The other he operated upon in private twelve months ago, and the larynx had healed and remained well. The operation was usually performed simply for the relief of dysphagia, for which purpose it was very successful.

Mr. Edward Davis replied that he could confirm what Mr. Barwell said as to the prognosis.

Case of Laryngeal Infiltration for Diagnosis.

By Harold Barwell, F.R.C.S.

Chelsea pensioner, aged 80. Hoarseness and slight dysphagia for three months; a little dyspnœa during the last two weeks. Enlarged movable glands on the right side of the neck and a small aneurysm at the left carotid bifurcation. The infiltration affects the anterior parts

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of both ventricular bands and appears smooth, dusky, and somewhat œdematous.   The right side is the more affected and its movements are more restricted than those of the left.   The cords appear to be normal. The sputum shows no tubercle bacilli, but large numbers of what appear to be pneumococci.

The PRESIDENT asked whether members could throw any light on the diagnosis.   One vocal cord was moving very freely, and there was no definite sign of ulceration.   He thought chronic tubercle was more likely than malignancy.

Suppurating Mucocele of Frontal Sinus in a Boy, aged 12.

By HAROLD BARWELL, F.R.C.S.

NOTE on February 21 : Severe " cold " two months ago, with profuse discharge from the left nostril.   Swelling on forehead noticed for one month ; eight days ago great swelling of eyelids, subsiding under hot fomentations.   No pain.   Hard, bony swelling over site of anterior wall of left frontal sinus, and in upper, inner angle of left orbit.   Streak of pus high up in left hiatus semilunaris, reappearing rapidly after mopping ; no pus after stooping.

DISCUSSION.

Dr. DAN McKENZIE said he did not believe that mucocele of the frontal sinus meant that the duct of the sinus was blocked and mucus accumulated in it.   He considered the condition to be due to the formation of a mucous cyst inside the sinus.

The PRESIDENT agreed with Dr. McKenzie's view as to the nature of some of the mucoceles.   With regard to the size of the frontal sinus in children, he remembered a boy, aged 8, whom he saw with acute frontal sinus suppuration complicating scarlet fever.   That boy had a sinus as large as a horse-bean.

Mr. EDWARD DAVIS said he made a post-mortem examination of a child aged 4, who died of orbital cellulitis following scarlet fever, and the question was whether the frontal sinus was responsible.   The frontal and sphenoidal sinuses were occupied by vascular cancellous bone, but there were no cavities. The antra were well developed, but without ostia, and the ethmoidal cells were very small.

Dr. BRONNER said he had seen two cases of frontal sinus disease after scarlet fever, and those children had large sinuses. He asked whether members had tried injections of tincture of iodine in frontal sinus disease. He had done so in two cases, and the discharge stopped after three injections.

Mr. BARWELL, in reply, said he agreed that the mucocele was a dilatation cyst of a mucous gland in the lining. In this case he could see a stream of pus coming into the nose; evidently the ostium was not blocked. He had had to operate on the boy since sending the notes of the case; the bone was considerably expanded and thin, and the sinus extended 1 in. above the orbital margin. He could not have done a Killian operation if he had wanted to, as the bone was too soft; he had performed the Ogston-Luc operation with immediate closure of the wound, and the case had done very well.

Congenital Tumour of the Septum, probably Glioma.

By FRANK ROSE, F.R.C.S.

F. D., AGED 10 months. Nasal obstruction was noticed at birth. The mother detected a swelling in the left nasal cavity at the age of 2 months. At the age of 4 months a pale, smooth swelling filled the left nasal cavity. It had a broad attachment to the septum, but none to the floor and outer wall. Its upper limit could not be determined. The swelling caused slight protrusion of the external nose. A piece was removed for examination and is believed to show the structure of a glioma.

Congenital tumours arising from the septum are rare. Two cases have been recorded, both of which were described as gliomata.

Mr. ROSE said he did not propose to do any more at present. He had removed a piece for microscopical examination. The only similar cases of which he had found records were those of J. P. Clark, in the *American Journal of Medical Science*. They were both males, and had the tumour on the left side, and attached to the septum; there was in them also some distension of the nostril. There was no evidence in either case that the tumour was malignant. The question was whether it was glioma; the microscopical appearances were difficult. He had submitted the specimen to Professor Andrewes and Mr. Shattock, and they agreed that, as far as one could tell by the microscope, it was a glioma.

Sarcoma of the Left Tonsil.

By Norman H. Pike, B.S.

The specimen was removed by me from Mrs. I., aged 26. Her history was that she had had an "ulcerated" throat over two years ago. For the past year she had noticed, when looking in the glass, that there was a lump on the left side of her throat. She frequently had sore throats and a more or less constant pain shooting up in front of the left ear. She had some stiffness on the left side of the neck and attacks of deafness in the left ear.

I first saw her at the Cheltenham General Hospital on January 23, 1913. Examination showed the left anterior pillar of the fauces to be pushed forward, presenting a rounded and swollen border; there was some extension of the swelling upwards. Palpation showed the whole mass to be of a cartilaginous hardness. Only a small portion of the tonsil was visible between the pillars of the fauces. Two small upper cervical glands were palpable. She heard the acoumeter at 5 metres with the left ear.

On February 3 a general anæsthetic was given. After a preliminary laryngotomy the left tonsil was removed by dissection, through the mouth, together with a portion of the anterior pillar. The tonsil shelled out easily, and there was little hæmorrhage. Care was taken to remove the lingual prolongation from the base of the tongue. The right tonsil was also removed. The pathologist, Dr. Hebblethwaite, reports a spindle-celled sarcoma limited by the capsule. The right tonsil was normal. The microscopical sections are also exhibited.

On February 20 two small cervical glands were removed, one about as big as a hazel-nut, the other the size of a pea.

DISCUSSION.

Mr. Pike added that it looked as if there was a local recurrence already, but it was only five weeks since removal. Was the prognosis of these cases always bad? The glands removed were examined microscopically and were free from sarcomatous cells.

Dr. Dan McKenzie said the prognosis of the condition was bad. Last winter he saw a case in which the course was only six weeks.

The President agreed as to the gravity of the prognosis. He had not seen a case recover in which the diagnosis was beyond doubt, although the tumour was easy to remove by a kind of enucleation.

Tumour in the Left Maxillary Antrum.

By John F. O'Malley, F.R.C.S.

F. L., AGED 54. This patient complains of obstruction in the left side of the nose for four months, pain referred to the teeth, and swelling of the face on the same side. The pain and swelling are getting worse lately. On examination one finds the left nasal cavity blocked by a greatly enlarged anterior end of the inferior turbinate, on the size of which cocaine and adrenalin have practically no effect. On the aspect of the turbinate, which is in contact with the septum, the mucous membrane is ragged, and on attempting to pass a probe the bleeding is very free. About the centre of the orbital boundary of the antrum a hard mass can be felt, which, when pressed on, causes the patient to wince and complain of pain in the left upper teeth. There is no disturbance of vision. Transillumination shows a good crescent on the right side and none on the left. Potassium iodide has been given for three weeks without any result.

Case of (?) Lupus of the Nose.

By John F. O'Malley, F.R.C.S.

H. H., FEMALE, aged 41, has had bilateral nasal discharge for three months, said to come on after an attack of " rheumatic fever." The history of the illness is not quite typical of acute rheumatism—i.e., swelling of both forearms from fingers to elbows, with blistering of the skin followed by scaling. No other joints were swollen. The mucous membrane on the septum, floor, and inferior turbinates of both sides looks uneven and sodden and covered in parts with moist muco-pus; there is some muco-pus in the upper nasopharynx, but no alteration in the mucous membrane, except around the orifice of the right Eustachian tube, where it is a little swollen. Portion of what appeared to be a granulation-like projection on the left inferior turbinate was sent for pathological report. This is not conclusive, but states " that the appearances are suggestive of lupus." Transillumination of the antra and frontal sinuses is clear.

DISCUSSION.

The PRESIDENT said he thought the appearances suggested sinus suppuration; he could not see any definite granulations in the nose. He had not seen lupus with such a free discharge of pus.

Dr. KELSON said he regarded it ·as a chronic septic condition, and he suggested that cultures should be made from it.

Mr. LAYTON suggested that the condition was ·due to very septic tooth stumps. He had seen recently several cases sent by dental surgeons in which there was a septic discharge from the nose, which had cleared up with removal of the septic stumps.

Mr. O'MALLEY replied that the sinuses were clear. There was a part which looked like a granulation mass, and he took it away. It was sectioned in Mr. Foulerton's laboratory and the report suggested lupus. The Wassermann reaction was negative. He used cocaine and adrenalin, but it did not give the pale look of the mucous membrane with the raised pinkish spots which one associated with lupus.

Case of Congenital Syphilis with Intranasal Lesions.

By JAMES DONELAN, M.B.

GIRL, aged 16. The stress of the tertiary ulceration fell on the left middle turbinal and septum. There is no perforation, but there was an abscess affecting the anterior border of the septum, which resulted in the present retraction. She has now been treated with mercury and iodides—at first by inunctions, and latterly chiefly with Donovan's solution, for nearly three years. She is so much better that it is thought some operative treatment to improve nasal respiration might be undertaken, as well as, possibly, an attempt to improve the external shape of the nose by means of paraffin. Salvarsan has not been employed in this case.

DISCUSSION.

Mr. JEFFERSON FAULDER thought the appearance of the nose might be improved. Before interfering he would have a Wassermann test done. With regard to the suggestion to use paraffin, he asked whether members had experience in elevating such depressions by means of a freshly removed piece of cartilage from another case, or from the same patient. He had done that operation. First, a small incision was made with a tenotomy knife over the

nasal bones, then with an elevator a bed was made under the skin for the cartilage, which was then placed in position, and the small incision over the nasal bone sutured. The immediate result was very good. He would show one or two of the cases.

The PRESIDENT thought the only cases suitable for paraffin were those in which there was a hard bony bed or support on which the injected paraffin could rest. He had never injected paraffin, but he had dissected it out in cases where it had wandered among the neighbouring tissues.

Case of Post-diphtheritic Adhesions of Soft Palate.

By JAMES DONELAN, M.B.

GIRL, aged 17. The patient suffered from severe diphtheria when aged 4. It will be noticed that there are post-diphtheritic cicatrices about the mouth. She had also double diphtheritic otitis. When aged 6 an operation was performed at the London Throat Hospital, Golden Square, for the relief of the palatal adhesions, and the palate was tied forward by means of ligatures passed through the nostrils for some two weeks, but the adhesions re-formed. At the age of 12 a double mastoid was performed at the Royal Ear Hospital by Mr. Bowen with successful result. The case is now shown with a view to elicit opinions as to the nature of the operation, if any, that should be performed to re-establish nasal respiration.

DISCUSSION.

The PRESIDENT said Dr. Donelan had been obliged to leave but had left a note stating that the patient was one of a large, healthy family, some older and some younger than the patient. The marks about the mouth were said to have been caused at the time of the diphtheria. These lesions were not now so common as they used to be before antitoxin was so freely used. The President asked whether the adhesion of the palate to the posterior pharyngeal wall, and the scars on the lip were the result of diphtheria, or due to syphilis. He had not seen definite ulceration in the palate even in the worst kind of pure diphtheria.

Dr. BROWN KELLY said the only treatment of use in this case was a broad hook attached to the denture, and worn for months.

Microscopical Section of Pedunculated Growth of Nose.[1]

By W. H. Kelson, M.D.

Man, aged 72. The section shows much dilated vessels in a connective tissue stroma. There is no history of epistaxis whatever. Do so-called " bleeding polypi " always bleed ?

Dr. Kelson said that Dr. Pegler wished him to say that he now agreed that it was a " bleeding polypus," but he considered that the situation of this one had probably protected it somewhat from trauma and that, therefore, it did not bleed.

Cyst of the Tonsil.

By T. B. Layton, M.S.

In the region of the upper part of the left tonsil there projects from under the anterior pillar of the fauces a small cyst having a diameter of ¾ in. The patient is a girl, aged 12, who came under observation for a sore throat, without any symptoms definitely due to the cyst.

A Man, aged 27, with Paralysis of the Right Vocal Cord and of the Right Half of the Palate (the Facial, Auditory, Glosso-pharyngeal, and Accessory Portion of the Vagus involved).

By J. Dundas Grant, M.D.

The patient was sent to the exhibitor on account of facial paralysis of seven days' duration ; this was preceded by pain in the right ear for seven days and discharge from that ear which has now lasted for a month. He had gradual dullness of hearing for six months, and for the last two days his voice has been weak and he experiences a feeling of weakness in deglutition. There is absolute immobility of the right

[1] Shown at the last meeting, see *Proceedings*, p. 77.

vocal cord close to the middle line; the palate is drawn to the left during phonation; to the laryngeal probe the sensation on the right side of the larynx is less marked than on the left. Taste is complete on the anterior part of both sides of the tongue and on the posterior pillar of the fauces and corresponding part of the tongue on the left side, but it is completely absent on the posterior part of the right side of the tongue and on the right pillar of the fauces. The optic disks, pupils, and extra-ocular muscles are normal. The masseters and tongue are normal in their movements. There is no cutaneous anæsthesia or analgesia. No weakness or ataxia of the limbs; the reflexes are normal.

The hearing tests are as follows :—

		Right ear			Left ear
For conversation	...	Contact (with " noise-machine" in left ear)	...	...	—
For whisper ...	...	... CO	...	...	... 20 feet
Galton ...	...	... 5	...	...	... 2
Bone-conduction	...	... Almost *nil*	...	...	... $-\frac{1}{2}$ sec.
Vertex ...	...	... <	...	...	... <
Rinne ...	...	negative (reversed)	...	...	+

There is no vertigo, and, on rotation, normal nystagmus was elicited on both sides. The nerves involved are, therefore, the facial, the auditory, the glosso-pharyngeal, and the accessory portion of the vagus on the right side. There is a bulging of the walls of the right auditory meatus, and in the interior can be detected some papillated granulation-outgrowth, and bare, rough bone is perceptible to the probe in the depths of the meatus and various parts of the walls, but the pain on probing was so great as to prevent it being carried out with any exactness. No specific history was obtainable, and no evidences of previous specific infection. The combination of signs indicates disease of the inner apex of the petrous bone, and in view of the fact that there is some flattening at the apex of the right lung where there has probably at a previous time been an active focus of tubercle, the likelihood is that in this case there is tubercular disease of the bone. A portion of the granulating outgrowth will be removed for microscopical examination, with a special view to the elimination of malignant disease. The Wassermann reaction will also be tested.

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Hæmorrhage into the Right Vocal Cord, the Result of an Accident at Football.

By W. M. Mollison, M.C.

Mr. H. W. E., a student at Guy's Hospital, while playing football a week previously received a kick in the neck on the thyroid cartilage, a little to the right of the middle line. He experienced a feeling of shock and of suffocation ; this passed off, and he found his voice was very weak ; he had, too, considerable pain on swallowing, and had a constant desire to swallow.

Seen within an hour of the accident he could scarcely speak, and an examination of the larynx showed slight swelling of the right vocal cord. On attempted phonation the cords approximated but the arytænoids were not symmetrical, the right getting a little in front of the left (this is no doubt a normal abnormality in this case). Two days after the accident the voice was still weak, but normal in character, and the patient felt well, though on walking he again experienced a feeling of suffocation, but in much less degree than before. The larynx then and now showed hæmorrhage into the right cord, while the left was normal.

Laryngological Section.

April 4, 1913.

Mr. HERBERT TILLEY, President of the Section, in the Chair.

Announcement.

THE PRESIDENT (Mr. Herbert Tilley) said that one of the matters which had just been discussed at the meeting of the Council of the Section might with advantage be made known at once, so that its purport might reach the various laryngological clinics. Many members of the Section thought that some of the junior practitioners of laryngology experienced a just grievance or a difficulty in that, although they wished to become members of the Section, they were precluded by the rule which enacted that their claim could only be established on the grounds of (a) professional eminence; (b) recognition by the Council of one or more publications in the literature of laryngology; or (c) having charge of a clinic recognized by the Council. A man, at the beginning of his laryngological career, might find it very difficult to establish his claim on any of these three bases. The Council had to-day decided to propose at the Annual Meeting in May that a duly qualified practitioner who had been a clinical assistant for not less than twelve months in a clinic recognized by the Council should be eligible as a member of the Section. This suggestion would be submitted to the Annual Meeting, but as that would not occur for some time he thought it desirable to ventilate the matter at this meeting.

Steel Shawl-pin removed from one of the Hyparterial Branches of the Right Bronchus, where it had been Lodged for Ten Days.

By HERBERT TILLEY, F.R.C.S.

B. W., AGED 42, was admitted to University College Hospital on March 18, 1913.

History: Ten days previously, while holding the pin in her mouth,

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she coughed and " felt the pin go down." Fits of coughing lasting for fifteen minutes followed. Two days later she felt intermittent pain in right side of chest near the mid-sternal line. On the sixth day more coughing, but none since.

March 17; Patient was " screened " by Mr. Worrall and the pin was located in the right bronchus with the point upwards ; the pin was on a level with the neck of the eighth rib.

March 18 : Patient was given a hypodermic of morphia and atropine at 5.30 p.m. and at 6 o'clock chloroform was administered by Mr. Beresford Kingsford, and when narcosis was established the larynx and trachea were painted with a 20 per cent. solution of cocaine, and the right bronchus entered by the direct method (Brünings's bronchoscope). Considerable difficulty was experienced in seeing the pin because the point was directed towards the observer, and when it was located it looked like a thin thread of mucus. Twice it slipped from the grasp of the forceps, but at the third attempt it was slowly withdrawn with the bronchoscope.

The operation lasted six minutes and the patient left the hospital next day none the worse for her experiences previous to or during her short stay in the hospital.

The PRESIDENT said he brought forward the case because of the difficulty of seeing the foreign body, and he wished to elicit whether other members had found similar difficulties in like cases. A pin, when inhaled into a bronchus, was apt to go down head-first, hence on looking down at it one's line of vision was parallel to the shaft of the pin, and it was difficult to see anything at all. Had it not been for the X-rays, the pin might have been missed entirely. Furthermore, the case showed that a patient might harbour a foreign body in the lung without any untoward symptom. On the other hand, four years ago he was asked by Sir Thomas Barlow and Sir Rickman Godlee to see a patient in the hospital who, it was thought, had inhaled a foreign body. She had a slight evening temperature, a hacking cough, and there were fine râles in the upper part of the left lung, so that the case might easily have been regarded as one of early tubercle, had not the X-rays demonstrated another reason for the symptoms.

An Instrument for Expediting the Examination of Embedded Tonsils.

By HERBERT TILLEY, F.R.C.S.

THE instrument is shaped like an ordinary Fraenkel's tongue depressor, but the distal end is replaced by a small concave bar placed at right angles to the shaft. If the outer portion of the tonsil is pressed on, the gland tends to face the observer, and often septic accumulation may be expressed which otherwise might pass unnoticed. Made by Mayer and Meltzer.

DISCUSSION.

The PRESIDENT apologized for showing yet another instrument for dealing with embedded tonsils. It was very useful in obtaining a more complete view of those inconspicuous tonsils which often concealed septic accumulations— a fertile cause of obscure pyrexias in young children and of recurrent attacks of tonsillitis in adults.

Dr. DONELAN regarded the instrument as a valuable one, not only for examination, but for treatment, as in follicular tonsillitis, if one wanted to cauterize or otherwise destroy the crypts. It differed materially from the late Mr. Baber's instrument.

Cast of the Epithelial Lining of the Œsophagus, from a Case of CHCl$_3$ Poisoning.

By G. N. BIGGS, B.S.

THE patient drank about 1 oz. of chloroform, which was at once vomited. For two days she complained of pain in the throat, and difficulty and pain on swallowing. There was no dyspnœa. On the third day she vomited the cast; there was no hæmorrhage. The patient was given 1-dr. doses of bismuth carb. 30 gr., lanoline 1 dr., and paroleine 1 oz., every four hours, and fed rectally for fourteen days. After remaining in hospital for six weeks the patient was examined by direct œsophagoscopy, when the surface of the œsophagus was found to be completely healed over and there was no tendency to stricture at any point.

The patient has recently been examined by direct œsophagoscopy— i.e., three months after taking the drug—and the œsophagus shows no tendency to contract at any point.

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Case of Sarcoma of the Right Tonsil.

By G. N. Biggs, B.S., and William Turner, M.S.

Female, aged 13. The patient came to the Out-patient Department of the Seamen's Hospital, Greenwich, on January 2, 1913, complaining of a sore throat and difficulty in swallowing.

History: Three weeks ago she noticed a lump on the right side of the neck, just below the angle of the jaw. It was not tender or painful. Shortly afterwards she experienced a pricking sensation on the right side of the throat, and her breath began to smell very foul. During the last week she had noticed that a swelling had appeared in the region of the right tonsil. She had become thin during the last three weeks although her appetite had been good.

Previous history: Patient has been a healthy child; no illness save scarlet fever and measles. No history of recurrent sore throat and no difficulty of breathing through nose or snoring at night.

Family history: No history of syphilis. Seven other children all alive and well; two died in infancy of lung trouble. Mother had no miscarriages. Father well and strong. No history of sarcoma on either side as far as could be ascertained.

Condition: When seen in the Out-patient Department on January 2, 1913, the patient was a rather delicate girl, but she did not look ill. The right tonsil was enlarged to the size of a large plum, projecting into the pharynx and pushing the soft palate forwards. The swelling was of a dark maroon colour, soft and fleshy in consistency, and was not tender to touch. The mouth was very foul, but at that time no necrosis of the growth was present. There was an enlarged lymphatic gland just behind the angle of the jaw, painless and very hard on palpation. When she came on January 6, 1913, the condition had advanced with extraordinary rapidity; the child looked pale and anæmic, and was very ill. Temperature, 101° F.; pulse, 120. Her breath was exceedingly foul, with a gangrenous odour. On examining the mouth it was seen that the whole of the tonsil had become gangrenous, and that this process had extended on to the right margin of the soft palate. The gland in the neck had markedly enlarged, and two or three other deep cervical glands in the region had appeared. These glands had now become tender. The child was admitted into hospital and given H_2O_2 spray, formalin mouth wash, alternately every hour, but the gangrenous

process continued to spread. Blood count: White blood corpuscles, 7,600; red blood corpuscles, 1,260,000; polymorphonuclears, 55 per cent.; lymphocytes, 45 per cent. Anæmia of secondary nature, with high mononuclears and low polymorphonuclears. Wassermann's reaction negative. Urine: Specific gravity, 1024; acid; no blood, albumin, or sugar.

Course: The growth rapidly extended in all directions.

Inwards: Three days after admission it had affected the right half of the soft palate, including the uvula. The picture presented at this stage was interesting. At the line of extension there was a swollen and deeply injected line of about 3 mm. width, running across the palate from the anterior right-hand corner to the posterior margin to the left of the uvula. The palate behind this line was simply a mass of foul gangrenous slough, pieces of which could be easily picked away. Thus the gangrenous process apparently followed immediately upon the extension of the growth. A week after admission the whole of the soft palate was involved, and on January 16 it had spread to the left tonsil, the whole of which became gangrenous. The odour at this time was horrible, and no deodorants had the slightest effect upon it.

Backwards: The posterior pharyngeal wall became involved and gangrenous towards the termination of the case.

Downwards: The lateral pharyngeal wall below the tonsil also became gangrenous nine days after admission.

The glands in the neck rapidly enlarged, so that at the end of the week there was a nodular mass behind and below the angle of the jaw on both sides. The skin became stretched and shiny, and later on the glands became softer and very tender, but they did not break down.

Swallowing rapidly became difficult, and later almost impossible, and very little nourishment could be taken.

The patient became weaker, and the toxæmia increased in intensity. The temperature rapidly rose, and the pulse-rate increased to 140 and 150 at the ninth and tenth day. She became emaciated, and towards the end was almost comatose. There were no physical signs of septic broncho-pneumonia. There was no stridor or dyspnœa.

Bleeding: Although the gangrenous process was so intense no serious bleeding occurred. On January 16 ligation of the common carotid was contemplated, but owing to the serious condition of the patient this was thought to be out of the question.

Death: On January 18 she died from acute toxæmia, without any other symptoms appearing.

POST-MORTEM NOTES (JANUARY 20, 1913).

Oral cavity : The pharyngeal space was found to be occupied by the enlarged tonsils which practically met in the middle line, and had a black, gangrenous appearance. Soft palate was involved and the uvula had disappeared.

Neck : All the glands in the neck on both sides of the trachea were much enlarged, discrete, soft, and not adherent to each other or to the adjacent structures. On section, they were uniformly white in colour, fleshy in consistency, and showed no signs of caseation or suppuration ; the glands in the upper portion of mediastinum were also enlarged.

Lungs : Emphysema of upper lobes of both lungs. On the pleural surface of lower lobe of right lung two small upraised swellings the size of a split pea were present ; ? secondary deposits.

Bases : Congested and œdematous.

Heart : Subpericardial petechiæ. Cloudy swelling.

Liver : Enlarged. Cloudy swelling and early fatty degeneration.

Kidneys : Enlarged, with faint yellow streak through cortex. Cloudy swelling.

All other viscera normal.

On section, microscopic : Gland of neck shows round-celled sarcoma with very little interstitial tissue lympho-sarcoma.

The PRESIDENT (Mr. Herbert Tilley) considered that the history of the case was almost unique in the rapidity of the ulceration. It would be interesting to know what bacteriological examination had been made.[1]

Cyst of Arytæno-epiglottidean Fold which has Burst Spontaneously.

By E. A. PETERS, M.D.

M. C., AGED 63, complained of slight choking sensation and loss of voice for a month. A red, tense swelling occupied the fold projecting beyond the middle line ; the arytænoid was forced into a position of phonation. The voice was hoarse and passed into a whisper. Seven weeks from the commencement of the symptoms the cyst appeared paler and more prominent. At eight weeks the voice suddenly returned, and the cyst will be seen to have collapsed and to exude mucus from a rupture on the upper surface.

[1] A bacteriological examination was carried out and revealed the presence of streptococci and staphylococci in large numbers in the throat.—G. N. B.

DISCUSSION.

Dr. PETERS said the point of interest to him was that the cyst had refilled. Some of these, if punctured, disappeared permanently; but that was not the case here. The patient complained of a little tenderness, but there had been no other evidence of inflammation. When the cyst burst, it was possible to see mucus escape from the rent surface. He would either pinch out a small piece of the surface, or apply the cautery, and make a larger opening.

The PRESIDENT asked the experiences of members as to these cysts filling up again after galvano-puncture. He had not been fortunate in this respect with a recent case in which he had used the method. To cure them he found it necessary to make a fairly thorough removal of the cyst wall. The previous day he had seen a patient who he thought risked sudden asphyxia, for an enormous cyst was filling the entry into the larynx and seemed to grow from the left arytæno-epiglottidean region. He cocained its surface, and then punctured the wall with the galvano-cautery, and removed the cyst wall as far as possible with forceps, used by the direct method. Finally he applied the galvano-cautery to the inside of the cyst walls. This was done some three weeks ago, but yesterday the patient returned with what appeared to be a recurrence of the lower part of the cyst and a thickening (? perichondritis), of the left half of the epiglottis and aryepiglottidean fold.

Dr. FITZGERALD POWELL said that for such cases he had been in the habit of using the galvano-cautery to destroy the wall of the cyst, and applying it fairly freely to the inside of the cyst, with the object of setting up adhesive inflammation. In this way he had obtained cures, and had not seen any recurrence of the cysts. Merely pinching out a portion of the cyst wall would not destroy the cyst, which was liable to refill unless adhesive inflammation took place.

Mr. WAGGETT thought the ideal method for dealing with these cases would be the suspensory method, using one hand to fix the cyst wall, and the other to cut it off cleanly with the cautery.

Mr. BADGEROW said he had used the galvano-cautery in three cases, and there had been no return of the cyst.

Cyst on Epiglottis, with Symptoms suggestive of Œsophageal Stricture.

By JAMES DONELAN, M.B.

PATIENT, a man, aged 59, was sent from the French Hospital to the Italian Hospital three weeks ago. He had been treated in the former hospital for gastritis. Six weeks ago he began to find difficulty in swallowing solids and about three weeks later liquids. He can, however,

at times swallow solids without much difficulty, and seldom has trouble with liquids. The difficulty takes the form of a sudden closure of the gullet, with rejection of the food, followed by a copious flow of mucus. No tumour or other abnormality could be detected by Röntgen-ray examination. A test meal containing bismuth was observed to pass without difficulty. The case appears to be one of spasm of the gullet, but how far the cyst on the epiglottis may act as an exciting cause remains to be determined.

DISCUSSION.

The PRESIDENT said he believed Dr. Jobson Horne had shown a case of a cyst of the epiglottis in which pain and difficulty of swallowing were complained of. Many weird symptoms were attributed to it, yet the cyst was only a small one. He asked whether Dr. Donelan proposed to operate on this case.

Dr. FITZGERALD POWELL said it seemed extraordinary that a small cyst in the epiglottis should cause so much trouble. There was difficulty in seeing the patient's arytænoids. The posterior wall of the pharynx seemed to bulge forward, and he wondered whether there might be a neoplasm in the pharynx.

Dr. DONELAN replied that he proposed to make an endoscopic examination as suggested by Dr. Hill. The patient was able to swallow good meals of meat, fish, and potatoes occasionally, and the screen examination revealed no abnormality.

Case of Post-diphtheritic Adhesions of the Soft Palate.

By JAMES DONELAN, M.B.

THE patient, a girl, aged 17, was shown at the last meeting.[1] It was suggested that the cicatrices about the mouth might be due to syphilis. The exhibitor, though he had no reason to agree with this view, has tried a mixed course of mercury and iodides during the last four weeks without the smallest resulting alteration in the appearances, save a little herpetic eruption on the lip. He still accepts the mother's account that they were caused by the formation of diphtheritic ulcers on the skin about the mouth. Members whose experience goes back to fifteen or twenty years ago will doubtless remember that this kind of disfigurement was more common than since the introduction of antitoxin.

[1] See *Proceedings*, p. 117.

DISCUSSION.

The PRESIDENT reminded the meeting that the question raised when the case was previously shown was as to whether diphtheria pure and simple could cause these ulcerative lesions, or whether they were caused by a consentaneous scarlet fever, or, on the other hand, were they of syphilitic origin or even due to some other microbic infection ? ·

Dr. WYLIE considered that the case still looked like a syphilitic one ; and that if " 606 " were given a difference would soon be manifest.

Dr. FITZGERALD POWELL said that even if syphilis were the cause, anti-syphilitic treatment would have no effect on the resulting scar tissue. The Wassermann test would be the best guide. The question of the extensive ulceration and formation of scar tissue, said to be produced by scarlatina, was discussed at this Society some years ago when similar cases were shown, and the general opinion was that in these days of antiseptics, this severe ulceration and scarring did not take place in scarlatina, but that nearly all cases were due to syphilis.

Dr. KISCH said he had charge of this girl for a short time at the Royal Ear Hospital, and went carefully into the history ; there was no suggestion of syphilis in the case. At that time he gave her a course of mercury and iodide, not with the idea of altering the local appearances, but to see what effect on the general condition would be. He was not convinced that it was diphtheria, which of itself very rarely caused ulceration, but suggested that the condition was due to a streptococcal infection.

Dr. DAN MCKENZIE thought that the throat appearance was that of syphilitic adhesions. If the Wassermann test proved negative, he supposed one could say the adhesions might have been due to diphtheria, though he had never seen such a degree of scarring from diphtheria.

Dr. PETERS suggested that in this case there might have been a mixed infection—scarlet fever and diphtheria. The latter disease by itself rarely, if ever, caused ulceration.

Dr. WATSON-WILLIAMS suggested that the title of the case should be so stated as to suggest that it might not be diphtheritic. There was only the mother's statement that it was diphtheria.

Dr. DONELAN replied that there was no reason whatever to suspect syphilis. As already detailed at the last meeting, the father and mother were healthy, and so were all the other children. Of course, he could not say that the case might not have been one of mixed scarlet fever and diphtheria. The disease occurred and the cicatrices about the mouth were formed thirteen years ago when the child was only aged 4. The diagnosis on the charts and books of the Hampstead Hospital appeared as diphtheria. Though it was nowadays rare, he did not agree that severe uncomplicated diphtheria was incapable of caus-ing scarring about the mouth from acrid nasal and buccal discharges, with

resulting ulceration. He had himself seen several such cases in the practice of the late Sir Morell Mackenzie and one in which a diphtheritic patch had formed over the sternum with a resulting cicatrix. If a Wassermann test had a negative result it would not prove that there had been no syphilis ; though, of course, a positive one, which he had no reason to expect in this case, would be of value. However, if it could be arranged, he would have a Wassermann test done.

An Unusual Case of Laryngeal Tuberculosis.

By E. D. DAVIS, F.R.C.S.

A WELL-DEVELOPED, healthy-looking young man with destruction of the upper portion of the epiglottis. When first seen the granulation tissue of the epiglottis obscured the view of the larynx. After several unsuccessful attempts to remove the diseased portion of the epiglottis with punch forceps, the patient was anæsthetized and Killian's suspension laryngoscopy apparatus was used and the epiglottis " trimmed." With the exception of the right ventricular band and cord the lesion appears to be confined to the epiglottis. Sputum : Tubercle bacilli present. Wassermann reaction negative. Chest : Obscure physical signs.

A sketch of the condition before operation and a microscopical preparation of tissue removed were shown.

Mr. E. D. DAVIS added that he was unable to remove the granulation tissue of the epiglottis, as it slipped out of the grasp of the forceps and dropped back into the larynx. He therefore cocained the epiglottis and with a general anæsthetic used Killian's suspension laryngoscopy apparatus ; he did not think he could have completed the operation but for this instrument, which enabled one to use both hands. Other attempts to remove the granulation tissue with various forceps had failed.

Tumour and Microscopic Section from a Case of Papilloma of Soft Palate.

By WALTER HOWARTH, F.R.C.S.

THE case was shown at the last meeting.[1] At the operation it was found that the tumour infiltrated the palate and extended deeply into the lateral wall of the pharynx on the left side. Bleeding was very troublesome, but a laryngotomy was avoided by the use of Kuhn's per-oral intubation apparatus. The section shows a round-celled sarcoma.

[1] See *Proceedings*, p. 99.

DISCUSSION.

Mr. HOWARTH said he thought it was extraordinary for the patient, aged only 7, to have had a papilloma last July, a pure fibroma in December, and a round-celled sarcoma in March. In answer to the President, he said there were no enlarged glands in the neck, but he removed soft palate and tonsil, and as much of the tumour as extended into the lateral pharyngeal wall. He had to leave a raw surface, but it granulated up, and so far there was no sign of recurrence. When he showed Kuhn's apparatus three months ago, none of the members seemed to have used it. He had found it satisfactory, and no blood entered the larynx. At St. Thomas's Hospital some of his colleagues used the apparatus for extensive operations on the tongue, and found it very satisfactory. There was considerable bleeding in this case, but it was controlled by forceps in the usual way.

Dr. DAN McKENZIE said he had hoped a pathologist would have said something about the natural history of this tumour as it changed its nature so much. Though tumours did not "breed true," the history in this case was surely a remarkable one. He would like to know whether there was a tendency to œdema after the use of the per-oral intubation in childhood. [Mr. HOWARTH : No.]

Case of Old Specific Laryngitis.

By F. F. MUECKE, F.R.C.S.

(For HUNTER TOD, F.R.C.S.)

URGENT tracheotomy done five years ago. Patient returned to the hospital for the first time this morning (April 4) with increased difficulty in breathing. Small warty growth in the trachea at the end of the tracheotomy tube.

DISCUSSION.

Mr. MUECKE asked whether anything should be done to remove the warty growth, which was quite hard.

The PRESIDENT suggested that if the exhibitor were to look lower down he might find that the trachea had been pressed upon by an aneurysm or mediastinal growth. It was a good case for the direct method.

Dr. PETERS said he closed the cervical opening and the patient could breathe through the larynx, but appeared to have bronchitis, or to have had it.

Dr. DUNDAS GRANT said he had reported a case to the Section in which, after performing tracheotomy for papillomata of the larynx, he found the patient was still unable to breathe until, by a great effort on the patient's part, a portion of soft papilloma was coughed up through the tracheotomy wound. Dr. Grant found it to be a sessile growth on the wall of the trachea, and he pulled away the remainder of it. That was the only occasion on which he had found anything similar to this case.

Mr. MUECKE replied that he had had another somewhat similar case. An actor, eight years ago, had had tracheotomy done on account of a syphilitic lesion of the larynx. He went back to Vienna, and two years ago he had " 606 " on two occasions. He had not been able to speak for eight years, nor breathe through the mouth. A few days ago he felt some tickling, which forced him to cough, and after causing him tremendous pain, a piece of bone came away about ½ in. square, partly necrosed. Then quite suddenly he found himself able to speak and breathe well. He did not know whether the " 606 " helped to extrude the necrosed bone.

Carcinoma of Left Vocal Cord ; Operation ; Arrest.

By G. SECCOMBE HETT, F.R.C.S.

MAN, aged 55, schoolmaster. Carcinoma of left vocal cord operated on two and a half years ago ; thyrotomy ; uneventful recovery. The growth came so near to the anterior commissure that it was found advisable to remove a small portion of the thyroid cartilage together with the anterior third of the right cord. Patient and section of growth were shown twelve months ago.[1] The case was then shown for the opinion of members as to whether vocal exercises might improve the voice. The patient has been treated by Mr. MacMahon, with great improvement to his phonation. He is following his occupation, and teaches a class of boys.

The PRESIDENT said this patient came to him two years ago, but operation was done by Mr. Hett when he (the President) was ill. Two and a half years ago it was shown as a case of good recovery, but the patient was voiceless. Mr. MacMahon had been doing something for him in the way of vocal exercises, and those who now heard the patient's voice to-day would have noted considerable improvement. In such cases a false cord often was produced, and a fairly good voice ensued. When this did not occur it was a question whether we might hope that, as in this case, vocal exercises might establish a better voice.

[1] *Proceedings*, 1912, v, p. 154.

Double Abductor Paresis and Stricture of Deep Pharynx and Upper End of Œsophagus, after accidentally Swallowing Glacial Acetic Acid in October, 1912.

By WILLIAM HILL, M.D.

PATIENT has been dilated up with Brünings's dilator (in January of this year) ; better for two months. Recently stricture symptoms reappeared. Intubated ; swallows by side of tube.

DISCUSSION.

Dr. DAN MCKENZIE said that there was an event in partial stricture of the œsophagus which had happened twice in his experience, and that was blocking of the stricture with food, whereby a partial was converted into an absolute obstruction. The first case was that of a woman who came to him with absolute inability to swallow, of sudden onset. Even liquids returned. He found himself unable to pass a large œsophageal bougie, but succeeded in getting a soft rubber catheter to pass. After removing it he tried the swallowing but the obstruction remained absolute, so he re-inserted the catheter and poured in some milk through it into the stomach. The patient had had nothing to eat or drink for some time, and the sudden ingestion of cold milk made her sick. She vomited the milk and with it a whole green pea. Immediately thereafter he found that the power of swallowing was quite restored. Further examination showed that the patient had an aneurysm. The explanation of this history was that the aneurysm had induced an obstruction of the gullet permeable in the ordinary way, but still so small that it could be perfectly blocked by a green pea, which acted like a ball valve, permitted the rubber catheter to pass, but was not displaced until the fluid propelled from below in the act of vomiting carried it away. This case, which he had seen several years ago, he had published at the time in the *British Medical Journal.*[1] The second case had been seen by him at the Central London Throat and Ear Hospital about a fortnight ago, the upshot being less fortunate than that of the case he had just narrated. The patient, a man, had had several distinct attacks of complete œsophageal obstruction, all of which had until then been relieved spontaneously. X-ray examination showed the stricture to be located at the cardiac orifice. The œsophagoscope, when inserted, plunged into a sacculated œsophagus full of dirty fluid in which were floating masses of half-chewed meat. These masses blocked up the orifice of

[1] *Brit. Med. Journ.*, 1907, i, p. 494.

M—11*b*

the aspirator so frequently that the emptying of this sac was a tedious and laborious task.   After the liquid had been got rid of, it was found that the œsophagus was blocked by about half-a-dozen chunks of chewed meat which had to be removed with Brünings's forceps before the actual stricture was reached.   Finally, one of Hill's feeding tubes was inserted, and by it the patient was fed for twenty-four hours.   At the end of that time, however, he insisted on the removal of the tube, and in the absence of the speaker this was done.   As the patient would not allow any further interference from above, a gastrostomy was performed, but a few days later he died.   The record of the case was incomplete, as a post-mortem examination was not made.   The only evidence as to the nature of the stricture was negative; the surgeon who performed the gastrostomy was unable with the finger in the stomach to find any sign of disease about the cardiac orifice, while the speaker had seen no signs of growth while working with the œsophagoscope.

Mr. WAGGETT asked Dr. Hill whether he found that his patients preferred the feeding tube in the mouth in preference to the nose.   His own experience was that it was preferred through the nose.

The PRESIDENT said his experience with such patients was the same as that of Mr. Waggett.

Dr. PETERS asked whether dilatation was so helpful in these cases as the passage of a small tube.   Apparently there was an interference with the musculature of the wall, and probably it was that more than stenosis, which prevented the passage of food.   So that probably the passage of a small tube was quite as efficient as dilatation.   There was always a tendency to recontraction.   The question of nasal versus mouth feeding was largely a question of nasal obstruction.   If the nose was obstructed or there was mechanical difficulty, the passage of even a soft tube was very irritating, whereas if the patient habitually breathed through the nose freely it was easy to feed by the nose.

Dr. DONELAN said it might be interesting to recall that the first person who recommended feeding patients by means of a tube passed through the nose instead of the mouth was Dr. W. Myles, of the Richmond Asylum, Dublin, who some thirty years ago introduced that system.   All patients who had to be fed in this way seem more comfortable with the tube through the nose. Of course, much depended on the size of the nasal passage and whether there were any septal projections liable to be irritated.   This was of great importance in cases like the present where the tube had to be permanently retained. Tubes made specially with a soft nasal portion gave good results in these cases.

Laryngological Section.

May 2, 1913.

Mr. HERBERT TILLEY, President of the Section, in the Chair.

Nearly Complete Paralysis of Left Vocal Cord of Unexplained Ætiology.

By WILLIAM HILL, M.D.

MALE, aged 24, came to the throat department at St. Mary's Hospital on April 4 of this year, complaining of loss of voice which followed the operation of internal urethrotomy three weeks before. On examination with the throat mirror the left cord was immobile and shorter than the right, the left arytænoid was in a considerably more forward position than the right and prevented sufficient approximation of the right cord to the paralysed left cord on attempted phonation The laryngoscopic picture suggests *long-standing* paralysis with post-paralytic contracture, which is not what one expected to find in view of the patient's statement that he noticed no dysphonia until after the operation in March of this year. He contracted gonorrhœa four years ago, and there is no history of this having been followed by arthritis. Examination of the neck and chest by the usual methods (including the X-rays) throws no light on the cause of the paralysis. The laryngoscopic picture closely resembles that figured in Morell Mackenzie's "Diseases of the Throat and Nose," p. 448, of a patient with long-standing dysphonia and paralysis of the left recurrent nerve of unascertained cause. Is the assumption correct that the laryngoscopic appearances in this case indicate *long-standing* unilateral paralysis? If so, what is the explanation of this sudden and recent onset of dysphonia?

[*Note* (made one month subsequent to the meeting).—The voice has much improved. There is fair movement of the cord, but the left arytænoid still occupies a more advanced position than the right, and does not move so freely.]

JU—10

Skiagram of Aneurysm of the Arch and Descending Aorta of which Physical Examination of the Chest gave no Indication.

By WILLIAM HILL, M.D.

AN old man from whom this skiagram was taken was shown by Dr. Hill at the Laryngological Section on December 1, 1911.[1] He came to hospital complaining of hoarseness; as the left vocal cord was paralysed he was sent to Sir John Broadbent with a request to ascertain if there were any indications of aneurysm on physical examination. Sir John reported in person that a careful examination of the chest
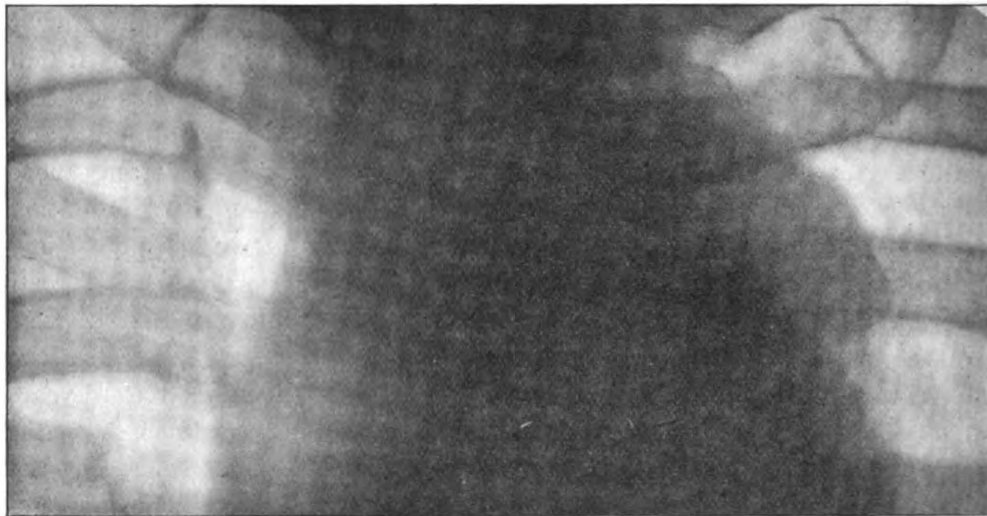
Portion of X-ray photograph (somewhat reduced) of Dr. Hill's case of aortic aneurysm.

revealed no positive evidence of aneurysm, but in view of the paralysed left cord and the unequivocal tracheal tugging (which he there and then demonstrated) he had no doubt whatever that an X-ray examination would confirm the diagnosis of aortic aneurysm. The skiagram shows that quite a large aneurysm may be overlooked if physical examination of the chest *alone* is relied on. Tracheal tugging, *inter alia*, should always be looked for in all adult cases with left recurrent paralysis.

[1] See *Proceedings*, 1912, v, p. 35 *et seq.*

Notes of a Case of Left Recurrent Laryngeal Paralysis, probably due to Dilatation of the Left Auricle.

By E. D. DAVIS, F.R.C.S.

MRS. P., aged 40, had well-marked mitral stenosis with hæmoptysis and failure of compensation. In 1908 she had been treated by Dr. Cordes, of Berlin, for loss of voice, by rest in bed and faradization of the larynx, and after treatment for two months the voice returned. In March, 1911, she again complained of loss of voice and stated that she had been sent to Margate for bronchitis and hæmoptysis and that the sputum had been examined for tubercle bacilli with a negative result. She had been in bed for three weeks, but there was no improvement in the voice, though the bronchitis was better. An examination showed more or less complete paralysis of the left recurrent laryngeal nerve with slight adductor movement and a little laryngitis. The skiagrams of the chest are shown. The X-ray screen revealed dilatation and displacement of the heart to the left and an opaque posterior mediastinum. Rest in bed improved the laryngitis but not the paralysis.

Left Recurrent Laryngeal Paralysis following Acute Endocarditis and Pericarditis.

By E. D. DAVIS, F.R.C.S.

MR. Q., aged 19, was extremely ill in July, 1912, with heart failure, mitral regurgitation, and pericarditis. When Dr. Wiltshire saw him in July the voice was weak and hoarse. The larynx was examined when the patient was convalescent, in February of this year, and complete left recurrent laryngeal paralysis, with slight compensatory over-action of the right cord was found. Skiagrams were shown.

Case of Right Recurrent Laryngeal Paralysis.

By E. D. DAVIS, F.R.C.S.

MR. G., aged 34, complained of deafness of the right ear following influenza. Incidental examination of the larynx showed right recurrent laryngeal paralysis, with over-action of the left cord. The palate and pharynx were normal. The voice was toneless, and the patient stated that he had lost his voice years ago. Skiagrams were shown, but no definite cause of the paralysis could be discovered. Physical signs at the apex of the right lung were obscure.

Case of Left Recurrent Laryngeal Paralysis.

By Cecil Graham, F.R.C.S.

A. C., MALE, aged 44. Weakness of voice since June, 1912. Occasional attacks of coughing, followed by vomiting. No hoarseness, no dysphagia, no enlarged cervical glands. Syphilis twelve years ago.
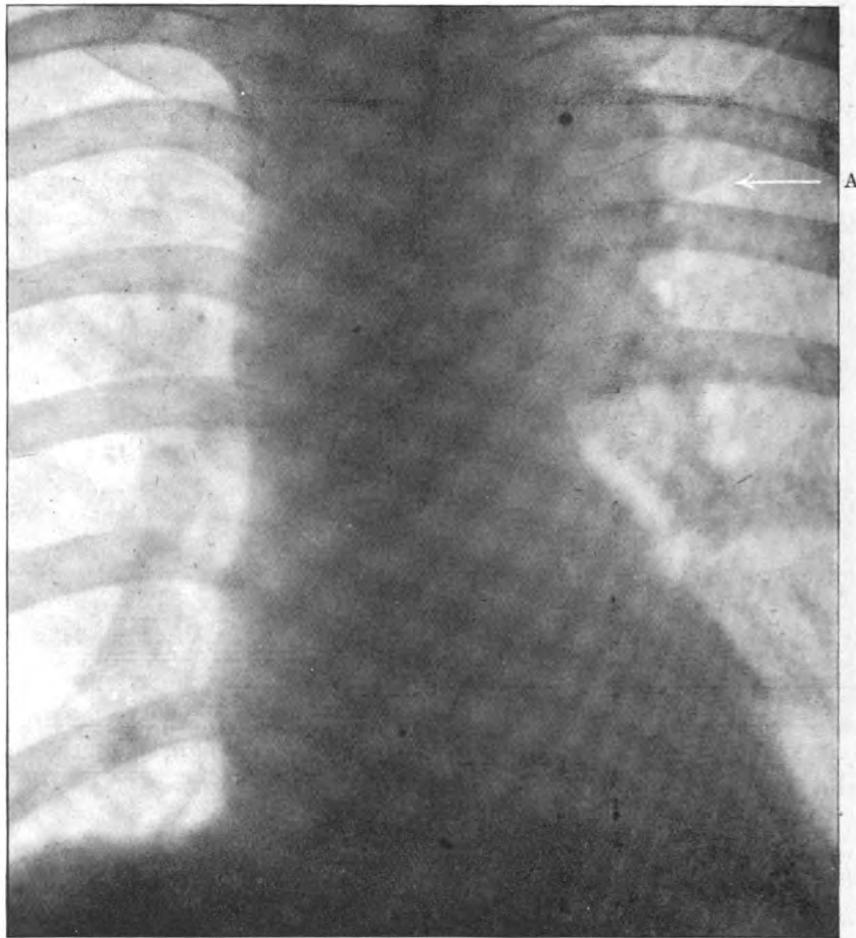
Skiagram (antero-posterior view) of Mr. Graham's case, showing great exaggeration of aortic shadow (A).

Wassermann reaction positive. Shortening of left vocal cord ; tilting forward of left arytænoid. Left cartilage of Wrisberg well defined. Radial pulses synchronous, and fairly full. Sluggish left pupil. Skiagram shown (*see* figure).

Discussion on the Ætiology of Unilateral Paralysis of the Recurrent Laryngeal Nerve.

Opened by F. DE HAVILLAND HALL, M.D.; Sir DAVID FERRIER, M.D., F.R.S.; and W. PERMEWAN, M.D.

DR. DE HAVILLAND HALL : In order that the question of ætiology of unilateral recurrent paralysis may be discussed in a systematic manner, and from all points of view, it seems to be essential that we should have a framework upon which to hang our facts. After careful consideration of the subject, I think that it would be impossible to draw up a more complete and scientific table of the causes of the recurrent paralysis than that compiled by Sir Felix Semon and adopted by Mr. Herbert Tilley in " Diseases of the Nose and Throat." So complete is the table that I have only one cause to add to the list—viz., dilatation of the left auricle, usually in connexion with mitral stenosis. I will give the table, therefore without further preface :—

(I) BULBAR AND BULBO-SPINAL AFFECTIONS.

(1) Hæmorrhage and softening.
(2) Syphilitic processes.
(3) Tumours.
(4) Diphtheria.
(5) Progressive bulbar paralysis.
(6) That curious form of systemic central nervous disease, first described by Hughlings Jackson and Morell Mackenzie, in which one-half of the tongue, the corresponding half of the palate, the corresponding vocal cord, and in a number of cases the corresponding trapezius and sternomastoid muscles are affected.
(7) Amyotrophic lateral sclerosis.
(8) Disseminated cerebrospinal sclerosis.
(9) Syringomyelia.
(10) Tabes dorsalis.

(II) PERIPHERAL AFFECTIONS.

(1) Acute rheumatic influences.
(2) Catarrhal neuritis.
(3) Toxic influences (lead, arsenic, &c.).
(4) Tumours in the posterior cavity of the skull, or in the foramen lacerum or foramen jugulare.
(5) Pachymeningitis.
(6) Traumatism (unintentional ligature of nerves, injection of iodine into a goitre, cut throat, stabbing, injury during extirpation of a goitre, &c.).
(7) Tumours of neck (goitre, peritracheal glands, &c.).
(8) Aneurysms of the arch of the aorta, innominate, subclavian, carotid.
(9) Mediastinal tumours (malignant, tuberculous, calcification of bronchial glands, &c.).
(10) Pericarditis.
(11) Pleurisy.
(12) Tuberculosis and pleuritic thickening of apex of right lung.
(13) Chronic pulmonary affections (chronic pneumonia, anthracosis, &c.).
(14) Infectious fevers (typhoid, &c.).
(15) Œsophageal carcinoma.

That I might have some concrete facts upon which to base a discussion I have carefully gone through the *Proceedings* of the Laryngological Society from its foundation until it ceased to exist as an independent Society—i.e., from 1893 to 1907. I have come across fifty-two cases of unilateral laryngeal paralysis. In thirty-five cases the left vocal cord was affected, in sixteen cases the right, and in one case the affected side is not mentioned. The following table gives a detailed list of the causes of the laryngeal paralysis:—

CASES OF UNILATERAL LARYNGEAL PARALYSIS FROM THE LARYNGOLOGICAL SOCIETY.

	Cord affected	
	Right	Left
Aneurysm of arch of aorta	1	7
,, ,, (subclavian)	1	0
Mitral stenosis and enlarged left auricle	0	2
Enlarged bronchial and other glands	1	6
Disease of apex of lung	1	0
Malignant disease of œsophagus	1	3
Thyroid tumours (? malignant)	0	1
Influenzal ... (vocal cord not stated, 1) ...	2	0
Diphtheria, lead (one each)	0	2
Neuritis	1	1
Tabes, syringo-myelia, disseminated sclerosis, bulbar paralysis, general paralysis of insane	2	5
In combination with other paralyses, as hemiplegia, facial, palate, pharynx, trapezius, and sterno-mastoid	6	4
Doubtful cause	0	4
(Side not stated, 1)	16	35

I have collected a further series of sixty-four cases of unilateral recurrent paralysis which I have observed myself. They are as follows:—

	Right	Left
Aneurysm of arch of aorta	2	21
Dilated left side of heart	0	2
Malignant disease of lung...	0	8
New growths in thorax	0	5
Malignant disease of œsophagus	8	5
Thyroid tumours	3	1
Neuritis...	3	1
Bulbar paralysis, tabes	1	1
Doubtful cause	0	3
	17	47

TABLE OF THE COMBINED FIGURES TAKEN FROM THE LARYNGOLOGICAL SOCIETY'S *Proceedings* AND THE CASES I HAVE OBSERVED MYSELF.

	Right		Left
Aneurysm of arch of aorta	3	...	28
,, ,, ,, (subclavian)	1	...	0
Mitral stenosis and enlarged left auricle	0	...	4
Enlarged bronchial and other glands	1	...	6
Disease of apex of lung	1	...	0
Malignant disease of lung	0	...	8
New growths in thorax	0	...	5
Malignant disease of œsophagus	9	...	8
Thyroid tumours	3	...	2
Influenza ... (vocal cord not stated, 1) ...	2	...	0
Diphtheria, lead (one each)	0	...	2
Neuritis	4	...	2
Tabes, syringomyelia, disseminated sclerosis, bulbar paralysis, general paralysis of insane	3	...	6
In combination with other paralyses, as hemiplegia, facial, palate, pharynx, trapezius, and sterno-mastoid	6	...	4
Doubtful cause	0	...	7
(Side not stated, 1)	33	...	82
Total 116			

Though the figures I put forward are comparatively few in number, still I think that they are sufficient to allow of some definite conclusions being formulated.

(1) The most common cause of left recurrent paralysis is aneurysm of the arch of the aorta. This occurred in twenty-eight times out of eighty-two cases. I would further point out that the seven cases in which no definite cause for the paralysis was discovered were all on the left side. Some of these seven were almost certainly aneurysmal, as long clinical experience has taught me that paralysis of the left vocal cord is often the only objective indication of aortic aneurysm. In a case of this kind, under my late colleague, Dr. Fincham, at the Westminster Hospital, I detected the cadaveric position of the left vocal cord nearly a year before there were any other definite physical signs of the aneurysm. In these days the question would have been easily settled by an X-ray examination.

(2) In cases of aneurysm of the arch of the aorta the left recurrent nerve is almost exclusively affected. This is shown by the fact that out of thirty-one cases of paralysis of the recurrent nerves from the pressure of an intrathoracic aneurysm, the left recurrent nerve was affected in twenty-eight cases, and the right in only three. In the Lumleian Lectures, recently delivered before the Royal College of Physicians, I

showed that paralysis of the left recurrent nerve not only points very clearly to the probability of the existence of an intrathoracic aneurysm, but it also indicates the position of the aneurysm as being seated usually on the transverse or descending part of the arch of the aorta. In thirty-five cases of aortic aneurysm recurrent paralysis was observed in twenty-one cases—nineteen times on the left side and twice on the right.

(3) The physical signs of valvular disease of the heart may exist in association with left recurrent paralysis, so as to very closely simulate intrathoracic aneurysm. Before the advent of the X-ray method of examination these cases were probably frequently mistaken for aneurysm.

(4) When the paralysis is due to the effect of pressure other than aneurysmal the left recurrent nerve is affected nearly four times more frequently than the right. If the cases of malignant disease of the œsophagus be excluded, it might be stated baldly that the right recurrent nerve is hardly ever paralysed as the result of pressure within the thorax. It also appears that, after paralysis of the left recurrent due to aneurysm, the most common cause of this paralysis is the pressure of some growth within the thorax. This very striking difference between the two recurrent nerves must be owing entirely to their anatomical distribution. It is easily seen why an aneurysm of the arch of the aorta should almost exclusively affect the left recurrent nerve, but it is difficult to understand why the right recurrent nerve should almost entirely escape the effect of other kinds of pressure.

(5) In cases of malignant disease of the œsophagus my figures show that the two sides are almost equally affected—i.e., nine cases of right recurrent paralysis and eight cases on the left side. This is as might have been expected, there being no reason why one nerve should be more often involved than the other in cases of cancer of the œsophagus.

(6) The occurrence of paralysis of the right recurrent nerve associated with dysphagia is almost invariably due to malignant disease of œsophagus. The same cannot be stated of left recurrent paralysis with dysphagia, but we should be justified in saying that the latter combination is most commonly due to malignant disease of the œsophagus. In exceptional cases dysphagia may be caused by an aneurysm of the descending thoracic aorta pressing on the œsophagus, while at the same time the left recurrent nerve is implicated in an aneurysmal dilatation of the arch of the aorta.

(7) When recurrent paralysis is due to central causes or toxins the

nerves are affected nearly equally. My figures show fifteen cases of right recurrent paralysis and fourteen of left recurrent paralysis.

(8) Age is an important factor in the diagnosis of the cause of the the paralysis. In children one would naturally think of diphtheria, tuberculous glands, cervical spinal caries, and meningitis. In young adults, pulmonary tuberculosis, pleuritic thickening at the apex of the lung, and mitral disease with enlargement of the left auricle would be the most likely causes. Under the age of 25 aneurysm is extremely rare. In middle-aged men—i.e., from 25 to 55—aneurysm is by far the most common cause. After the age of 60 the probability of malignant disease of the lung or of the mediastinal glands should be borne in mind.

The sex of the patient should also be taken into account, as thoracic aneurysm is a comparatively rare disease in females; therefore, left recurrent paralysis in a woman would not be of the same value in suggesting the presence of an aneurysm as in the case of a man. In the Lumleian Lectures I quoted figures to show that thoracic aneurysm occurred in men as compared with women in the proportion of eight to one. Recurrent paralysis in a woman would suggest the pressure of a new growth, malignant disease of the œsophagus, or dilated left auricle rather than an aneurysm.

CASE ILLUSTRATING LEFT RECURRENT PARALYSIS.

M. L., female, aged 19, consulted Dr. de Havilland Hall on June 8, 1912, complaining of hoarseness and choking when she drank, the choking being worse with hot than with cold fluids. Left vocal cord in cadaveric positions. Impulse in fifth space, mid-clavicular line. Increased area of cardiac dullness. Double aortic and double mitral murmurs. Right pupil larger than left. Right pulse larger than left. History of rheumatic fever at the age of 6 or 7. Has suffered from rheumatism since. Skiagram shown.

Sir DAVID FERRIER, F.R.S.: Though I have ventured, on the invitation of your President, to take part in this discussion, I do not intend to occupy your time with any disquisition on the various causes of recurrent laryngeal paralysis, their diagnostic indications, or their relative frequency. Naturally, everything that tends to impair the vitality and conductivity of the nerve, such as pressure, neuritis, however caused, and structural changes in general, will have the same ultimate effect. The paralysis so induced may be complete or incomplete. In the complete form all the muscles innervated by the recurrent

laryngeal are paralysed, and the vocal cord is in the cadaveric position. In the incomplete form the paralysis, or paresis, affects mainly, or exclusively, the posterior crico-arytænoid, and the vocal cord is immobile or nearly so, in the median position. As to the relative frequency, the incomplete is by far the most frequent form of recurrent laryngeal paralysis.

On what depends its special feature? Many years ago when I was engaged writing a paper on the " Localization of Atrophic Paralyses,"[1] in which I endeavoured to show that in peripheral paralysis, from whatever cause, neuritis, &c., the extensor muscles were the first to suffer, Sir Felix Semon called my attention to the fact that the abductors of the vocal cords were the first muscles to be paralysed in affections of the recurrent laryngeal nerve. I at once saw that this fell in line with the other facts on which I had based my conclusions. These may be summarized as follows :—

In peripheral neuritis, however induced, as from alcohol, lead, arsenic, beri-beri, &c., the extensor muscles of the limbs are the first, and often alone, affected. In lead poisoning we have the familiar drop-wrist, while the supinator longus supplied by the same nerve escapes. So in alcohol we have at first drop-foot from paralysis of the muscles supplied by the external popliteal nerve. A similar condition obtains in beri-beri. Take again the case of pressure on the peripheral nerves. While severe and long-continued pressure on the musculo-spiral nerve causes paralysis of all the muscles supplied by this nerve—supinators as well as extensors—yet instances occur in which only the extensors are affected. So also in puerperal paralysis from pressure of the fœtal head on the crural plexus, the muscles especially paralysed are the anterior tibial group supplied by the external popliteal nerve. The same thing happens in neuritis of the sciatic nerve, or when it is injected with Schlösser's fluid for the treatment of sciatica. All these facts point to a greater vulnerability of the extensor nerves to destructive influences. Parallel with this, and of the same significance, is the fact discovered by Onimus, that the extensor nerves lose their excitability after death sooner than the flexors and adductors. The greater vulnerability of the abductor fibres of the recurrent laryngeal, as exhibited in the effects of neuritis, pressure, cold, &c., is only an example of a more general law applicable to extensors in general. So far the law.

As regards the recurrent laryngeal paralysis so common in tabes, the

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[1] *Brain*, 1881-82, iv, pp. 217, 303.

form with which I am most familiar, the question is whether it is due to central or peripheral causes, or perhaps both. Opinion is still divided on this question, and I am bound to say that after reviewing the principal literature bearing on it, I think that there are many points still requiring careful investigation by modern methods, and with more accurate anatomical knowledge of the nerve-centres than has been displayed in many of the published clinical records. There is, however, no doubt that, in the vast majority of cases of tabetic recurrent paralysis, neuritic or degenerative changes have been found in the vagus trunk, recurrent laryngeal, or in the intramuscular nerve-endings, particularly in the posterior crico-arytænoid muscles. Though degenerative changes have also in several instances been described in the medulla oblongata, particularly in the floor of the fourth ventricle, it is questionable whether in any case of pure tabetic laryngeal paralysis of the usual type, primary degeneration has ever been demonstrated limited to the nucleus ambiguus, the recognized motor nucleus of the laryngeal muscles. So far as I have been able to discover there are only two cases of tabes on record in which primary central lesion appears to have been demonstrated. The one is the case recorded by v. Reusz,[1] the other by a Russian lady whose name I cannot venture to pronounce — Valerie Wyscheslawtzewa — quoted by Grabower.[2] In both of these cases, however, there was complete recurrent paralysis; and in one of them (v. Reusz's) there was paralysis also of the pharynx, palate, and partially of the tongue. These cases, therefore, cannot be regarded as typical of the condition usually found in tabes. And in those cases in which degenerative changes have been described in the nucleus ambiguus among others they may have been secondary to peripheral lesion—the so-called " réaction à distance," or retrograde degeneration.

In illustration of the further remarks I have to offer on this question I would beg to remind you of the anatomy of the *nucleus ambiguus*, the motor nucleus of the ninth and tenth cranial nerves. The nucleus ambiguus lies in the reticular formation ventral to the grey matter of the fourth ventricle, as shown in the first slide. The second is a schematic representation of the relative position of the motor and sensory nuclei of the medulla oblongata. The third is a schematic diagram of the roots of the vagus. One branch (the sensory) goes to the fasciculus solitarius; a second to the medio-dorsal nucleus, the exact

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[1] *Arch. f. Psychiat.*, Berl., 1899, xxxii, pp. 535-49.

[2] *Arch. f. Laryng. u. Rhinol.*, Berl., 1910, xxiii, p. 59.

functional signification of which is not quite determined, though probably visceral ; and a third, the motor root proper, to the nucleus ambiguus.

The nucleus ambiguus constitutes a column of cells several milli-metres in length, and according to the researches of Kosaka on dogs[1] is capable of differentiation into three subdivisions—an upper, middle, and lower, as seen in the figure before you. The upper is the motor nucleus of the pharynx, œsophagus and crico-thyroid. The middle is the motor nucleus of the palate. The lower is again divisible into two —viz., a ventral and a ventro-lateral. The ventral is the motor nucleus of the recurrent laryngeal, and the ventro-lateral of the inhibitory nerve of the heart. The individual muscles of the larynx have no doubt their own cell groups, but they have not been separately differentiated.

Now, if one considers the relatively small size of the cell groups constituting the nucleus, and their community of vascular supply, it would appear very unlikely that any acute lesion, such as that of anterior poliomyelitis, could pick out the cell groups of some only of the laryn-geal muscles, or even all, without implicating to a greater or less extent those also of the palate and pharynx. As a matter of fact, this occurred in the case recorded by v. Reusz ; and in the symptom-complex due to embolism of the posterior cerebellar artery paralysis of the palate and larynx are always associated with each other.

It is, however, theoretically possible that a chronic and slowly pro-gressive degeneration, like that of muscular atrophy or bulbar paralysis, may pick out the cell groups of the abductors apart from the others. But I know nothing in the symptomatology of muscular atrophy which would support this contention. The extensor muscles are never indi-vidually affected in this disease. And in bulbar paralysis, in which the lips, tongue, pharynx and larynx are progressively affected, the weakness of the adductors of the vocal cords is the first symptom to attract attention to the larynx. Whether this is preceded by paresis or para-lysis of the posterior crico-arytænoid muscles I have no observation of my own, nor have I seen it recorded as a phase in the symptomatology of bulbar paralysis. Schlesinger,[2] however, holds that this occurs in bulbar syringomyelia ; but Iwanow,[3] who has directed special attention to this point, has never, in the twenty-eight cases he examined, seen one in which there was paralysis of the posterior crico-arytænoid without

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[1] *Neurol. Centralbl.*, Leipz., 1909, xxviii, p. 406.

[2] " Die Syringomyelie," 1902.

[3] *Neurol. Centralbl.*, 1907, xxvi, p. 1115.

implication also of some of the other laryngeal muscles. The point is, however, one well worthy of further investigation.

Taking all the facts into consideration, and pending further precise examination of the recurrent laryngeal nerves and their motor nuclei, I am inclined to adopt the view already expressed by many eminent laryngologists and neuropathologists—e.g., Cahn, Dejerine and Petren, Oppenheim, &c.—that the recurrent laryngeal paralysis usually observable in tabes is of peripheral origin, and conforms to the law applicable to mixed motor nerves in general—viz., that the extensors and abductors are more vulnerable and lose their vitality sooner than the flexors and adductors.

Dr. W. PERMEWAN : In an attempt to ascertain the various causes of unilateral laryngeal paralysis, and the relative frequency in which they occur, it is plain that an accurate result could only be arrived at by the publication and collation of every observed case. That is an impossibility at the present moment, and indeed even an approximation to that ideal is very difficult to attain. Various causes contribute to this state of things : in the first place the majority of general physicians and surgeons do not even yet practise laryngoscopy themselves, or habitually call in to their assistance those who do. Secondly, in the early stages of unilateral paralysis symptoms are, as a rule, either absent or so inconspicuous as not to attract the attention of the physician, unless he is especially on the look out. I think it essential at this point once more to repeat what is a commonplace to us, but which is by no means generally recognized or acted upon—viz., that in the first stage of unilateral organic paralysis there is no affection of voice, as the abductors are alone affected, and no affection, or a very slight affection of breathing, because the other cord is able to make up the deficiencies. Thus it is that unilateral abductor paralysis is often missed, or only discovered by accident.

The records of cases are also by no means complete. There is a natural failure to record cases which are due to the commonest causes. It is of little interest to publish cases, for instance, of left-sided paralysis due to aortic aneurysm, while any unusual or obscure case is carefully put on record. The result is that there is in any statistical statement an undue relative predominance of rare cases. So too, in studying and comparing various collections of cases made by different authors, it is difficult to avoid the error due to the frequent repetition of the same case in various connexions. The results, therefore, of statistical inquiry

cannot at present be taken as in any way of absolute value. But, as on the other hand the individual experience of any one observer is insufficient to establish general results, the study of records is the only way of arriving at even an approximation to the truth.

I have given in this paper two sets of recorded cases: one, the 150 cases published twenty-two years ago by Avellis from the Clinic of Schmidt, of Frankfort; the other, the result of the collation of all cases recorded during the past ten years in the *Centralblatt für Laryngologie* and the *Journal of Laryngology*, checked by reference to the French laryngological journals. I think it may be taken as true, that the *Centralblatt*, under the guidance of our master in this subject, Sir Felix Semon, is not likely to have missed anything of importance in relation to laryngeal paralysis.

In the year 1891 Avellis[1] published an analysis of 150 cases of recurrent paralysis from Dr. Moritz Schmidt's Clinic. Out of these 150 it is noticeable that not much more than one-half—viz., either seventy-eight or eighty-five—were traced certainly to their source. Nor, in fact, is it stated that any considerable proportion of these were confirmed by post-mortem examination. Still, observed as they were by the best clinicians of that day, they stand as an indication, more or less accurate, of the various causes which lead to unilateral laryngeal paralysis. It is convenient, therefore, to take these observations as a starting point, and I will rapidly detail them to you. Two striking facts are, that of 150 cases 106 were in men and only 44 in women. Twelve were bilateral and therefore do not concern us to-day, but of the unilateral cases ninety-two were paralysis of the left cord and forty-six of the right cord. It is very strange that in the abstract given in the *Journal of Laryngology* the relative frequency of left-sided and right-sided cases has been reversed. The two striking facts are that men are very much more liable than women, and also that left-sided paralysis occurs much more frequently than right-sided paralysis. On p. 149 is a list of the cases as given.

As to individual causes, in Avellis's seventy-eight ascertained cases, the most frequent cause—viz., in twenty-four cases—is aneurysm; of these only two were in women. Next to aneurysm come fourteen cases of thyroid enlargements or growths, twelve cases of tubercular infiltration of the lung, seven of glands in the neck, and five of cancer of the œsophagus. Of the less frequent lesions I will only mention the one case of pericarditis, the two cases of abscess due to disease of

[1] *Berl. Klinik*, 1891, 40, Hft., pp. 1-26.

cervical vertebræ, and the one, and one only, case of paralysis due to disease of the bronchial glands.

Here, then, is a *catalogue raisonnée* of a considerable number of cases observed by the methods of twenty-two years ago. It is quite plain that at that date it was impossible for the best observers to detect the cause of unilateral paralysis in more than about one half of the cases under their observation. It is highly improbable that at the present day such a failure of diagnosis would have to be recorded. For that

AVELLIS'S FIGURES PUBLISHED IN 1891.

CAUSE OF PARALYSIS.

Tubercular infiltration of lung :—		
Right ... ... 7 ⎫		
Left ... ... 5 ⎭ 12		12
Enlarged gland in neck 7		7
Abscess of cervical vertebræ 2		2
Goitre 14		14
Pericarditis 1		1
Tumour of œsophagus 5		5
Aneurysm 24		24
Cerebral disease 1		1
After operation on goitre 1		1
After tracheotomy 1		1
After syphilis 3		3
? Paralysis or contracture 2		2
Pleuritis sicca 2		2
After diphtheria 1		1
Bronchial gland 1		1
With furuncle in neck 1		1
		78
Unascertained cause 72		72
Total 150		150

progress there are, I think, at least several causes. First, of course, the discovery of the Röntgen rays; secondly, the knowledge of the existence of laryngeal palsy in the chronic diseases of the medulla and spinal cord; thirdly, the appreciation of the various toxic conditions that can and do affect the motor nerves of the larynx from their source to their termination; and, fourthly, the attention that has been paid since 1897, but paid, as I shall suggest with some want of discretion, to the fact that diseases causing enlargement of heart are sometimes associated with implication of the recurrent nerve, and paralysis of the left side of the larynx. Of these causes of improved diagnosis at the present day the use of the X-rays is the most important. It is now possible

to diagnose an aortic aneurysm (but not all of them) in the absence of physical signs by radiography. So, too, it is possible to distinguish in the same manner between an aneurysm and enlargement of the left auricle : and the discovery of enlarged bronchial, mediastinal and peritracheal glands is an easy matter for the radiographer. Only in the last two months I have seen a case in which I suspected aortic aneurysm from the existence of left-sided paralysis, and in which there were no other signs whatever, at once cleared up by a screen examination by the X-rays. It may be stated with some confidence that the number of cases of laryngeal paralysis due to chest conditions which escape diagnosis as to the cause, will, if competent search is made by X-rays, become in future very small.

I know no more scientific classification of the causes of unilateral paralysis than that given by Sir StClair Thomson in his work on "Diseases of the Throat." He takes the motor nerves of the larynx from their origin in the medulla down to their termination in the laryngeal muscles and considers what disease may affect them in the long course. I say from the medulla, because, in spite of some alleged cases recorded by Casselberry and others, I do not think it is established that there have been in reality any instances of unilateral paralysis due to disease of the cerebral cortex, or the tracts from the cortex to the medulla. Thomson's classification is both exhaustive and complete. I have taken the liberty of reproducing it, and I hand round copies, showing the relative frequency in recorded cases of the various lesions given in the test.

RECORD OF THE PAST TEN YEARS.

UNILATERAL LARYNGEAL PARALYSIS.

Analysis of cause in 360 cases.

(1) *Cerebral lesions* (Casselberry)	6
(2) *Bulbar lesions :—*	
(a) Vascular, thrombosis, embolism, hæmorrhage	1
(b) Syphilitic	4
(c) Tumour, aneurysm, abscess	0
(d) Diphtheria	2
(e) Degeneration of nuclei :—	

Bulbar paralysis ...	1	
General paralysis ...	0	
Tabes dorsalis ...	9	
Disseminated sclerosis	0	51
Amyotrophic lateral sclerosis	0	
Syringo-bulbia ...	41	

Carried forward	64

Brought forward	64.

(3) *Lesions of motor fibres in vagus and recurrent nerves :—*

(*a*) Intracranial growths at base of brain	0
(*b*) Extracranial growths close to exit of vagus...	1

(*c*) Traumatic lesions of nerves in neck :—

(i) By horn of bull ... ...⎫	
(ii) Dislocation of clavicle ... ...⎬	4
(iii) By wagon : consecutive aneurysm of subclavian artery⎪	
(iv) Injury in thyroid region ... ...⎭	
(*d*) Injury during operations on thyroid gland	14
(*e*) " Traumatic " : either injury or during operation	45
(*f*) Thyroid enlargements and growths	10
(*g*) Pericarditis	0
(*h*) Pleuritic thickening at apex (cf. tubercle of lung)	1
(*i*) Aneurysm of arch of aorta	30
(*j*) Aneurysm of innominate artery	9
(*k*) Aneurysm of right subclavian artery	1
(*l*) Aneurysm of left subclavian or carotid arteries	0
(*m*) Enlargement of heart from mitral stenosis...	10
(*n*) Broncho-pneumonia from irritating dust	1
(*o*) Tubercle at apex of lung	11
(*p*) Cancer of lung, with glands	4 ·
(*q*) Enlarged bronchial glands	2
(*r*) Mediastinal growths	10
(*s*) Carcinoma of œsophagus	11
(*t*) Carcinoma of neck	1
(*u*) Peritracheal glands	2

(4) *Peripheral neuritis :—*

Mineral poisons : lead	3
Vegetable poisons	0

Toxins of acute and other infections :—

Diphtheria	2
Influenza	1
Rheumatic	1
From " cold "	1
" Toxic paralysis," cause not stated	95

(5) *Inflammatory lesions of abductor muscles :—*

Injury from swallowing foreign body	3
Injury from washing out stomach	1

(6) *Other causes :—*

Mediastinitis	1
Tumour of spinal cord	1
Tumour in nasopharynx	1
Left paralysis in right pneumothorax	1
Apical pneumonia	1
" Syphilis of aorta," cured by mercury	1
Pan-sinusitis of nose	1
Distortion of aorta and mediastinum by left-sided lung disease ...	1
Beri-beri : either toxic, or from cardiac hypertrophy or hydro-pericardium	1
Kypho-scoliosis	2
Poliomyelitis	1
Myotonia atrophica	1
Abscess around œsophagus	1
Following operation for adenoids	1

(7) *Unknown causes* ... ... | 7

Total	360

JU—11

Before I refer in detail to these results it will, I think, be useful to quote observations published in 1910 by Guder and Dufour on sixty-three cases of unilateral paralysis.   Of these thirty-six were left-sided and twenty-seven right-sided.   They read as follows :—

Aortic aneurysm	16
Two of these were right-sided and due apparently to co-existing innominate or subclavian aneurysm.	
Thyroid enlargements	7
Generally incomplete paralysis.	
Operations on the thyroid	11
Complete, but often recovered.	
Cancer of the œsophagus	7
Mostly of left cord.	
Cancer of the lung	4
? From pressure of glands.	
Tuberculosis of the lung	4
Either from glands or pleuritic thickening, or neuritis.	
Enlarged left auricle	2
Tabes dorsalis	4
Following washing out of stomach	1
Cause unascertained	7
	—
Total	63

The figures of Guder and Dufour probably give something like the real relative frequency of the more common causes.   As to the 360 cases given in the table, it is at once obvious that there is a very large and undue predominance of the toxic cases and those due to traumatism.   Still, the very numbers show that these are frequent and important causes of unilateral paralysis, and it is probable that in toxic affections will be found the explanation of a considerable number of cases whose cause has not been definitely ascertained. The frequency of aortic aneurysm as a cause of left-sided paralysis is known to all of us.   Statements have been made by myself, among others, that in left-sided cases when no other obvious cause is present, aortic aneurysm will be found to be the cause in a very large percentage of cases.   What that percentage is exactly it is impossible to say. Very many cases of aortic aneurysm are never subjected to laryngoscopic examination.   Many others are not detected at all till sudden death either suggests or reveals its existence.   Some cannot even be detected by radiography, and in particular, so I am told by radiographists, just those small aneurysms of the under surface of the arch

which particularly affect the recurrent laryngeal nerve. In the last edition of Schmidt's work on "Diseases of the Upper Air Passages" the editor says: "The commonest cause of paralysis of the left recurrent is aneurysm of the aorta. Among the symptoms of aortic aneurysm paralysis of the left recurrent is practically always the earliest, and it remains often for a long time the only sign. There are cases which remain to the end completely symptomless, so that they can only be diagnosed with great difficulty." Delavan, of New York, says practically the same thing. I have myself had experience of many cases in which the presence of an aneurysm was first shown by the onset of recurrent paralysis. I think we may conclude that, given a case of left recurrent paralysis, aortic aneurysm is the first thing to be thought of, and must not be excluded unless it has been sought for with every diagnostic aid at our command.

One cause of left recurrent paralysis, to which much attention has been given during the past sixteen years, is the association of it with mitral stenosis. The first recorded case was in 1897 by Ortner, and since then about forty cases have been described. By far the best analysis of these cases is that made by J. Garel in the *Annales des Maladies d'Oreille*, &c., 1910.[1] While admitting fully the fact of left recurrent paralysis being associated with the heart changes which follow mitral stenosis, Garel points out that at least two-thirds of the cases were unconfirmed by an autopsy, and that even in those that were examined post mortem the account of the finding does not always carry conviction. One case which was diagnosed as due to pressure on the nerve from a dilated left auricle was found, on examination, to be really due to implication of the recurrent in glandular thickening. The suggestion that the left auricle when enlarged may compress the nerve against the arch of the aorta does not, to my mind at any rate, seem very convincing. The more probable explanation is that, when the heart becomes much increased in weight by hypertrophy of the right ventricle, that is enough to drag on the aortic arch, and thus stretch and eventually paralyse the nerve. I have shown to-day one heart much enlarged from mitral stenosis, and one enormously hypertrophied from a patent foramen ovale. Each of these cases, which were given me by my friend Dr. Nathan Raw, suffered for some time before death from loss of voice, but as no laryngoscopic examination was made— it was some years ago—I show them not so much as examples of

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[1] *Ann. des mal. de l'oreille, du larynx* [&c.], Par., 1910, xxxvi (ii), pp. 315-24.

recurrent paralysis from mitral disease, because the proof is absent, as to suggest that the greatly increased weight of the heart in this affection may well be considered the real factor in producing that paralysis of the nerve which we know to occur.

Unilateral paralysis in tabes dorsalis is by no means uncommon. Burger's great work of twenty years ago and the observation of Semon have fully established the fact that laryngeal paralysis is sometimes the earliest observed sign of this disease. Eighteen years ago I published some cases of paralysis of the larynx in general paralysis of the insane, and noted the occurrence of unilateral affection in a certain number of those cases. I have not repeated the observation, but have no doubt that from the close relationship of tabes dorsalis and general paralysis, laryngeal paralysis would often be observed to occur. In my table there are forty cases of paralysis from syringo-bulbia. It is not surprising that a disease which actually destroys by gross lesion the nuclei of the vagus accessorius should result in paralysis of the larynx. According to Ivanow, who observed these cases, the posticus is the first affected, and then the whole domain of the recurrent nerve. But often, in place of being strictly unilateral, there is complete paralysis of one side with affection of either the posticus or the internus of the other side. He is bold enough to suggest that Semon's law requires revision. The neurotic group of cases is a large one. The various causes are given in the table; they no doubt explain a considerable number of cases for which no clear organic cause can be found, and they are also the class of case, and possibly the only class of case, in which recovery occurs.

The bilateral representation of the movement of the laryngeal muscles in the cerebral cortex makes it extremely improbable that cerebral disease should produce unilateral paralysis. Yet Casselberry refers to six of such cases. Of course it is possible that destruction of both centres may occur at the same time : but until every case has been examined, and the existence of no disease of the medulla is demonstrated, it will be safer, in my judgment, to assume the non-existence of cerebral unilateral laryngeal paralysis.

In conclusion, I venture to suggest that if for the next ten years observers systematically put on record every case they meet with of unilateral paralysis, it will be possible then to do what is not possible now — viz., to establish the real relative frequency of the various causes.

Sir FELIX SEMON said that the subject chosen for this discussion was so large as to make it impossible within the limit of time accorded to a single speaker to discuss *all* the points in which he was interested. Thus he had reluctantly to pass by the questions of recurrent paralysis caused by mitral stenosis and of unilateral recurrent paralysis, said to be due to cerebral disease. He would limit himself to discussing the points raised by Sir David Ferrier.

Sir David had stated that laryngeal abductor paralysis, characteristic of partial lesion of the recurrent laryngeal, was only an instance of the more general law which he (Sir David) had endeavoured to establish many years ago—viz., that the nerves of the extensor muscles of mixed motor nerves are more vulnerable to destructive influences than those of the flexors and adductors. With regard to this statement Sir Felix wished to observe : (1) that the suggestion was as old as the proclamation of the fact itself, inasmuch as Ottomar Rosenbach had referred to the apparent analogy which Sir David wished to' establish in his very first paper on the question ; (2) that even if this analogy held good, it would only be an amplification, not an explanation, of the curious fact and would not elucidate in the least the cause of the vulnerability of the abductor fibres. But he (Sir Felix) gravely doubted, even after Sir David's interesting remarks, whether the laryngeal phenomenon could be claimed as a simple instance of Ferrier's more general law, although he fully admitted, of course, that it seemed to fall into line with it, inasmuch as the laryngeal abductors in one sense were as antagonistic to the adductors as were the extensors and flexors of a limb, seeing that they served opposite movements. But with this likeness the similarity ended, and for the rest the physiological conditions of the antagonistic muscles of the larynx were widely different from those of the antagonistic muscles of the limbs. He had discussed this question at length in Heymann's "Handbuch der Laryngologie," to which he would refer those interested in it, and would here only briefly recapitulate : (1) That, whilst the antagonistic muscles of the limbs served physiologically equivalent functions, those of the larynx served *two different* functions (phonation and respiration), which were differently represented in the cortex and in the medulla ; (2) that Risien Russell had found that after division of the adductor fibres of both recurrents *no inhibition* of the abductors could be obtained on stimulating the cortex with strong induction currents, such as Sherrington had found in the case of genuine antagonistic muscles in other parts of the body ; and (3), above all, that the laryngeal

antagonists differed from other antagonistic muscles in the sense that *organic* progressive disease always attacked the *ab*ductors first or even alone, whilst in *functional* affections the *add*uctors suffered similarly exclusively. He (the speaker) did not know of analogous conditions in any other part of the body. For all these and other reasons he was convinced that the mutual relations of the antagonistic muscles of the larynx were of a much more complex nature than those of the antagonistic muscles in other territories, and, in spite of the apparent analogy of which Sir David Ferrier had spoken, he could not admit that the conditions as observed in the larynx were a mere local illustration of Ferrier's general law.

With regard to Sir David's second proposition — viz., that the balance of evidence was in favour of the peripheral origin of tabetic laryngeal paralysis, he could not agree to this statement either. In his opinion that question was still quite open. The partisans of the exclusively peripheral theory had either ignored older carefully observed cases, such as his own, in which the microscopical examination of the nucleus ambiguus had been made by so great an authority as the late Dr. Beevor [Sir DAVID FERRIER: I remember that case, degeneration occurred in other nuclei in regard to which there were no symptoms at all—the tongue and so on], or had attempted to explain them away by maintaining that the medullary degeneration must be of secondary nature—a statement which so far had been neither proven or disproven. Altogether, the number of reliable post-mortem examinations, by which alone this question could be decided, was at present still much too small for that purpose, and he would exhort the members of the Section not to let a single opportunity slip to increase our knowledge of the subject, carefully examining in every case of tabes accompanied by laryngeal phenomena which ended fatally, whilst under their observation, all the parts in question from the nucleus ambiguus downwards. Personally, he could not understand why, as in the analogous case of the oculo-motor paralyses of tabes, the original lesion might not be as well of a central as of a peripheral origin, and he would ask Sir David Ferrier why, if it were always peripheral, so frequently *bi*lateral abductor paralysis should be observed ? But even if it could be shown that the laryngeal paralyses of tabes were always of peripheral origin, that would not in the least militate against the correctness of his law, the non-validity of which could be demonstrated in one way only—viz., by post-mortem examinations and microscopical investigations of the vagus-nucleus, which would have to show that whilst there were foci of

degeneration in that nucleus the adductor muscles alone—or at any rate in a higher degree—were atrophic and degenerated, whilst the abductors had either entirely escaped or were, at any rate, less diseased than the adductors. Thirty-two years had now elapsed since the promulgation of his law, and in the whole of that time one single exception only had been actually established in a case of recurrent paralysis of peripheral origin (Saundby's), not a single one in a case of central causation.

And this brought him to Sir David's remarks about the initial adductor paresis sometimes observed in cases of *apparently* bulbar paralysis. That fact, too, had been recently brought forward as a proof against the validity of his law, although the observations in question had been of a clinical character only, and in not one single case had it been shown, by microscopical examination of the parts after death that, whilst the *highest* point in which foci of disease had been found was the nucleus ambiguus, the adductor muscles were exclusively or preponderatingly atrophic and degenerated. The reporters of such cases had obviously overlooked his statements in Heymann's handbook in which he had explained that cases of apparently bulbar paralysis, in which such initial adductor pareses were observed, did in reality not belong to the class of *bulbar* paralysis but to that of *pseudo*-bulbar paralysis—i.e., to that category in which foci of disease existed—either alone or in conjunction with actual bulbar lesions—*above* the laryngeal nucleus, viz., in the paths leading from the cortex through the corona radiata and the internal capsule to the medulla. Such cases, however, did not at all fall into the territory of his law, which only concerned the laryngeal nerves *from the nucleus of the vagus downward !*

In conclusion, he wished to say, with reference to Dr. Permewan's remark, that there had been lately a cry for " revision of Semon's law " that he heartily agreed with that demand. If it should be found by further investigation that the law was bad, the sooner it disappeared from accepted doctrines the better ; if the law was good it would remain valid, as it had done now for more than thirty years, in spite of all attacks. He would loyally accept the result, but he must again emphasize that such a decision could only be arrived at on the strength of thorough and complete post-mortem examinations and microscopical investigations carried out by experts, not on the basis of purely clinical observations, which, as the past had abundantly shown, were open to numerous fallacies and mistakes.

Dr. WATSON-WILLIAMS said it was difficult for him to add points of interest in this discussion after the able papers of the introducers and the admirable speech of Sir Felix Semon.   Those whose acquaintance with laryngology preceded the introduction of skiagraphy would admit that the value of laryngeal paralysis or paresis in cases suspected of aneurysm was not now so momentous as formerly, because in most cases skiagraphy would solve the problem.   His experience was that the paralysis due to aneurysm was generally of the left cord.   He would mention one of several similar cases which he saw before the X-ray days.   The patient was an elderly gentleman with a history that whenever he went out he caught a cold, became hoarse—his liver was supposed to be upset; and it was on the latter account—as he (the speaker) was then practising as a physician—that he was asked to see the patient.   The hoarseness led to examination of the larynx, and he was found to have left abductor paralysis.   Though no other evidence of aneurysm was obtainable, the suspicion that he had that condition was so strong that he provisionally diagnosed the condition.   His suggestion was that when he took exercise he increased the size of the aneurysmal sac and so the pressure effect on the left recurrent nerve was greater and consequently the paralysis.   After several days' rest in bed he was sufficiently recovered to have only abductor paresis, whereas with exercise the thyro-arytænoideus internus was also paretic. He asked whether such a variation in degree due to aneurysm had been observed by others.

With regard to the points raised by Sir David Ferrier and Sir Felix Semon, it struck him at once that the question as to whether the tabetic lesions were peripheral or central in origin in no way controverted Semon's law, though it was a matter of great interest.   There were cases in which there was an association of abductor paralysis of one vocal cord with the corresponding side of the palate, due perhaps to the fact that the levator palati was innervated by the nucleus ambiguus; also cases in which the vocal cord abductor paralysis had been associated with a lesion of the hypoglossal nucleus; and he thought these pointed to a central origin.   There were also cases of persistent pulse frequency occurring in the subjects of tabes who showed abductor paralysis.   He did not think those cases were very rare, and hence in the first edition of his book he said one might almost lay down as a dictum that " *in the absence of febrile disturbance or other obvious cause (such as exophthalmic goitre), persistent increase of pulse frequency associated with laryngeal abductor paralysis or paresis points to bulbar nuclear*

degenerative lesions." The explanation was that it was due to associated degeneration of vago-cardiac inhibitory nuclei in association with degeneration of the nucleus ambiguus.[1]

Mr. E. D. Davis said he had shown three cases with the hope of extracting information from members. He asked whether there was any definite post-mortem evidence that apical pleurisy and tuberculosis were causes of right recurrent laryngeal palsy. In the large majority of cases of tuberculosis with adhesions at the apex of the lung, right recurrent palsy did not occur. He, therefore, did some post-mortem work at Charing Cross Hospital. In the first two cases there were enlarged glands in the mediastinum : One was a case of a child aged 12 months, in which there was no lesion of the larynx, and no paralysis had been observed ; but the enlarged glands had pushed the vagus forward, and so pulled upon the recurrent nerve. The nerve was nowhere in relation to the pleura or the mediastinal pleura. In the second case the gland enlargement was due to sepsis, and here again the vagus was pushed forward, and pulled on the recurrent laryngeal nerve. One would think such a condition would more frequently cause right recurrent nerve palsy than was the case. In the next two cases there were extensive adhesions at the apex of the lung from advanced tuberculosis, but the right recurrent nerve was not involved. In another case there was mitral stenosis with dilatation of the auricle and considerable mediastinitis, and here again the left recurrent nerve was not implicated. He had shown a case of mitral stenosis, and when the case was first seen an extract appeared in the *Lancet* of August 12, 1911, showing that Dr. Fetterolf and Dr. Norris, of Philadelphia, had carried out a number of dissections in hardened subjects to show the relation of the left auricle to the arch of the aorta. The conclusions they arrived at were that the dilated auricle might press the left pulmonary artery against the recurrent laryngeal nerve and the aorta, and so produce neuritis and paralysis of that nerve. That seemed a feasible explanation. But the authors added that other causes of left recurrent laryngeal palsy should be excluded, such as mediastinitis. In the case he had shown, it looked very much like dilatation of the left auricle, but mediastinitis could not be excluded.

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[1] This case of aneurysm he had mentioned died of bursting of the aneurysm shortly afterwards.

Mr. T. GUTHRIE remarked that Dr. Permewan referred to the fact that almost all the cases of recurrent paralysis which recovered belonged to the neuritic group.   In some of those cases it was very difficult to be certain that there had been such neuritis; at any rate there seemed to be no cause of neuritis in the patient.   He wished to refer to four cases, one of which was a patient of his own, one he saw with Dr. Middlemass Hunt, and the other two were seen by Dr. Hunt, who had kindly allowed him to refer to them.   In all, recovery ensued in from three to eight months.   They were men ranging in age from 25 to 43.   The paralysis was sudden in onset, and complete from the first.   In two the larynx was in other respects normal, apart from the paralysis; while in the others there was complete paralysis of one cord, accompanied by paresis of the internal tensor of the opposite cord.   One of the latter cases was that of a clergyman who, the previous day, had been preaching in the open air.   There was congestion of both cords.   In three cases it was the left and in one the right nerve that was affected.   In all cases the recovery was gradual, but complete.   The first of the four patients was seen twelve years ago, and the last only last year.   Two of the patients attributed the sudden hoarseness to over-use of the voice ; the third to strain of neck muscles; while the fourth could suggest no cause.   In this latter case the history was that the patient left home in the morning with a normal voice, bicycled a short distance to the station, and on arriving there was voiceless, in which condition he remained a fortnight. Mr. Guthrie saw him a fortnight after the occurrence, by which time the voice had begun to return.   There was then complete left recurrent paralysis, with marked paresis of the right internal tensor.   Possibly in this case the paralysis affected both nerves originally, but the right only slightly, and by the time he was seen the right had largely recovered. In none of the cases could the cause of the paralysis be discovered. He did not think any of the patients could be called rheumatic ; nor was there evidence of toxic trouble.   It would be interesting to know how many of the seventy-two cases which had been mentioned recovered. He hoped some members would be able to suggest a cause in cases where the ætiology was obscure.

Dr. JOBSON HORNE : The valuable tables which two of the introducers of the discussion have placed in our hands cannot fail to impress anyone, who may still stand in need of being impressed, with the multiplicity of diseases which may give rise to paralysis of a recurrent laryngeal nerve, and also with the importance of the laryngoscope as

an aid to the recognition of obscure disease. From these tables can be deduced the frequency of any one cause relatively to all causes of paralysis of a recurrent laryngeal nerve. From the standpoint of the practitioner, however, the determination of the relative frequency of unilateral paralysis of the recurrent laryngeal nerve as an outward and visible sign of any one disease, or of a phase of any one disease, would be of greater value. Such statistical tables at present are not available owing to the neglect, as has already been pointed out, of laryngoscopic examinations by physicians and surgeons generally in the absence of symptoms pointing to a laryngeal lesion.

Some years ago, for the purpose of ascertaining the earliest changes in the larynx in pulmonary tuberculosis, I made a routine practice of examining and recording the condition of the larynx in all cases with symptoms suggestive of the possibility of thoracic disease. In 359 consecutive cases of pulmonary tuberculosis, in which the larynx was examined, unilateral paralysis of the recurrent laryngeal nerve was met with in seven cases. In five of these cases the right cord was paralysed, and in four out of the five physical signs of pulmonary disease were found in the right apex. In the other two cases the left cord was paralysed, and in both there were physical signs of disease at the apex of the left lung.

Although aneurysm of the aortic arch is the most common cause of paralysis of the recurrent nerve, nevertheless one ought to be cautious before basing a diagnosis of aneurysm upon symptoms of the disease coupled with this physical sign alone. I can call to mind such a case occurring in the pre-Röntgen days. There was marked paralysis of the left recurrent laryngeal nerve and symptoms strongly suggestive of aortic aneurysm, but other physical signs were absent. It was noticed that the thyroid cartilage was displaced to the right, and it was subsequently established that the laryngeal condition had been occasioned by an attempt at strangulation in quite early life. The fact that aortic aneurysm cannot always be discovered by means of the X-rays further emphasizes the importance of a routine laryngoscopic examination of obscure cases of thoracic disease. In a case of angina pectoris some time under my observation, dilatation of the aortic arch suddenly and acutely developed: the first sign of the aneurysm was sudden loss of voice and paralysis of the left recurrent laryngeal nerve.

Sir STCLAIR THOMSON desired to associate himself with the President's expression of satisfaction at the choice of the subject for the discussion. He had suffered a good deal from this subject himself. Those who simply took the subject from the text-books might not be aware what it meant to try and wade through the literature of the subject in an effort to clear up what still remained a very abstruse problem. He had tried to read half of what Grossmann said about Semon, and very nearly all of what Semon said about Grossmann! He (the speaker) once struggled to write a chapter on this matter for his text-book, and sent it to Sir Felix to ask his opinion thereon. The reply he got was that the subject had been completely mixed up, and was still chaotic. He felt so grateful for such candour that he wrote it all over again, and he succeeded in making it clear to himself at all events. One could not separate the clinical ætiology from the pathology of the subject; as that could not be done, the discussion that afternoon had not been as valuable as it might have been. Still, there was an improvement since the days of Avellis, when 50 per cent. of these cases were undiagnosed, and this improvement was largely due to the introduction of X-rays and the recognition of paralysis in chronic bulbar lesions. Toxic causes had also been recognized ever since influenza had been so much with us. The association with cardiac enlargement was still open to discussion. There would still be a large number of cases undiagnosed when the laryngologist was asked to help the physician, who brought a case and was told there was recurrent nerve paralysis, and that he must examine the patient's chest and neck, and interrogate his nervous system. An example was Dr. Hill's case shown just before the meeting. He (the speaker) had a similar case in a young man who when he first appeared at the Golden Square Hospital was aged 16, and he was followed up until his twenty-seventh year. He had persistent complete paralysis of one vocal cord. Since those days the Wassermann reaction and a greater disbelief in humanity had shown what a number of syphilitic cases there were about. With regard to clinical ætiology, the table of Avellis referred to cases occurring " after operation for goitre," whereas in the table prepared by Dr. Permewan they were put down as " injuries during operations on thyroid gland." No doubt there was traumatism of the recurrent laryngeal nerve in some cases, but it was only due to surgeons to point out that some of the cases were really " after operation," and not a consequence of direct injury during the operation. Where the nerve

was afterwards found to be paralysed, the patient looked aggrieved and the surgeon was obviously disappointed, and yet it might have been no fault of the operator. Those cases were not examined with the laryngoscope soon after the operation, as they should be. He knew some cases in which the cords were freely moving a week after the operation, and later became paralysed. He found that this occurred in cases in which the neck wound did not heal by primary intention; they were cases in which the surgeon was compelled to put in a drainage-tube, or in which a stitch abscess formed.

Dr. DUNDAS GRANT said he had listened with great interest to what had been contributed in this discussion, and he wished to take part in order to direct attention to one of the toxic forms of recurrent nerve paralysis. A number of years ago he recorded two cases in which he thought any one who read his reasons would agree that they were instances of alcoholic neuritis of the left recurrent laryngeal nerve. He took great care to exclude other causes in attributing the cause to alcohol, especially as these were exceptions to the general rule that toxic paralyses were bilateral. Dr. Permewan recently asked him about cases, and he told him of these two, but Dr. Permewan was unable to find them. This was due to a misprint in the Table of Contents in the *Journal of Laryngology* for that year. The cases are described in vol. xii, p. 540, as follows:—

Case I.—The first case is that of a clergyman, aged 40, who consulted me on account of weakness of his voice which came on suddenly at the commencement of a service. The condition persisted, and it had become necessary for him to find a remedy or to resign his position. I found complete immobility of the left vocal cord, both in respiration and phonation in the cadaveric position. There were some very limited movements of the cartilage of Santorini, but the thorax appeared to be absolutely normal, and it was impossible to elicit any evidence of previous specific infection in spite of the absolute candour of the patient. In inquiring further into his previous ailments I elicited the fact that he had recently suffered from sciatica on the left side, from which he had not yet completely recovered. He was still subject to paroxysms of pain, and there was a considerable degree of anæsthesia of the skin of the affected limb. It seemed to me more than probable that the so-called sciatica was a neuritis, and that the paralysis of the vocal cord depended upon an identical condition affecting the left recurrent laryngeal nerve. It only remained, then, to discover some cause sufficient to account for the production of these neurotic conditions. There were no signs of locomotor ataxy; and I thought of toxic neuritis. There was no indication of lead, mercury, or arsenic; and it was, therefore, necessary to approach the question of alcohol. There was complete absence of appetite in the morning, and the patient had frequently suffered from disturbances of the liver (acute gastritis); and I observed a singular negligence with regard to his dress, and even the general care of his person, which was quite out of harmony with his professional and social position—in fact, I suspected a tendency to the abuse of alcoholic stimulants. The patient admitted, in fact, that he drank

at least a pint of strong stout at each meal, and that in addition he spent the evening up to a late hour in reading and drinking brandy and water. He had not the slightest idea that his excess in alcohol had given rise to his symptoms ; but he allowed himself to be convinced, and undertook to make the sacrifice necessary for his recovery—namely, complete abstinence from alcohol. He obtained, at the same time, a short period of rest from his professional duties, during which he took fairly large doses of tincture of nux vomica. After a rest of some weeks he returned to his duties, and found his voice as strong and reliable as before his illness. I was able to assure myself, by laryngoscopy, that the movements of the vocal cord had again become normal. When last seen the voice was excellent, the larynx natural in every respect, and the sciatic symptoms had disappeared. The patient had lost his morning anorexia, he had certainly improved in his general condition and was able to fulfil his duties without the least difficulty.

Case II.—A lady, of middle age, consulted me on account of an obstinate cough, which fatigued her both during the day and prevented her from sleeping at night. Beyond a slight bronchial catarrh I found nothing except a well-marked paralysis of the left vocal cord. During the examination of the chest I observed the cicatrix resulting from the amputation of the right breast, which had been carried out several years before on account of a tumour suspected of being cancerous. Under these circumstances I feared the development of a carcinomatous condition in the mediastinal glands, but beyond the paralysis of the left recurrent nerve there was no other sign of it. There was further no indication of syphilis or tuberculosis. I then elicited that the patient complained of well-marked nausea and loss of appetite in the morning, and that she was subject to bilious attacks. I recommended the greatest discretion in the use of alcohol and wrote to her family medical attendant, communicating to him my suspicion that there was a tendency to excess in alcohol, and asking him whether he had any reason to share it. He replied that such an idea had not occurred to him, and that he could hardly believe that the lady, who was well known and respected, could be thus affected. Two weeks later she returned, stating that the morning nausea had considerably diminished, but that she was still troubled with a cough. Her general condition had improved, but the vocal cord was still completely paralysed. The husband, who accompanied her, made the spontaneous inquiry as to whether the use of brandy would be injurious to his wife, because she had acquired the habit of taking frequent doses of it, on account of certain cardiac attacks, and that she " poured the spirit into a large glass without measuring it." This confirmation of my suspicion allowed me to speak openly, and I insisted that the daily allowance of stimulants should be limited to two glasses of Marsala. After another fortnight I saw the patient once more. The general condition had greatly improved ; the husband assured me that the cough had diminished both by day and by night, and I made out some distinct movements of the left cord of slight extent but quite unmistakable. On examination at the end of another ten days the movements were still more pronounced, and I ventured to assure the patient that the affection of the larynx did not depend in any way upon malignant disease.

That kind of case he regarded as quite rare ; he had not had other similar cases in his own practice. Alcoholic neuritis was generally bilateral, and the abductors were usually affected, so that the symptoms had generally been those of interference with respiration, whereas in Dr. Grant's cases there was hoarseness. He had shown to-day a microscopical specimen from the case he brought forward at the March meeting[1] showing giant cells, in confirmation of the idea that it was due

[1] *Proceedings*, p. 118.

to a tuberculous lesion situated near the apex of the petrous bone. It would be remembered that the case was that of a young man who had facial paralysis and acoustic paralysis, with paralysis of the right vocal cord, right half of palate, and the right glosso-pharyngeal. He took the man into Brompton Hospital. He had headache also. Under rest he recovered somewhat from that, but began to get some difficulty in moving his legs. Was there extension of the disease to the pyramidal tracts ? He did not think that could occur without involvement of the hypoglossal, which was quite intact. Therefore he operated in the mastoid region, and found considerable tuberculous rarefaction of the petrous bone, and during scraping of the roof of the antrum there was a flow of pus from the interior of the cranium. Free opening of the cranium revealed a fungating growth, evidently tuberculous, on the surface of the dura mater, the size of half-a-crown, which confirmed the provisional diagnosis made when the patient was shown at the March meeting.

To-day Dr. Grant had brought a case which resembled paralysis of the left recurrent nerve. There was some fixation of the left vocal cord in abduction, but there was sufficient infiltration of the ary-epiglottic fold and ulceration of the inner side of the arytænoid cartilage to account for the fixation in that position. But the question was as to the possibility of recurrent paralysis, and Dr. Melville, who was present now, had made a beautiful skiagram. From Dr. Melville's description there was evidently considerable fibrosis and evidence of thickening in the mediastinum, which compressed the œsophagus, and might very probably involve the recurrent laryngeal nerve. But in view of the local condition the exhibitor thought there was enough to account for the fixation of the cord in the position mentioned.

The alcoholic cases he mentioned earlier recovered.

The PRESIDENT (Mr. Herbert Tilley) announced that Dr. Logan Turner had sent from Edinburgh an analysis of 100 cases of either unilateral or bilateral paresis of the recurrent laryngeal nerve. In that series the cause of the paralysis was known in fifty-nine cases, and unknown in forty-one.

He (the President) felt greatly interested in the opening papers, as well as in the clinical experiences of Mr. Guthrie and Sir StClair Thomson. During the past five years in his private practice he had seen many cases of paralysis of the recurrent nerves. In some the

cause was easy to determine—e.g., aneurysm, mediastinal growth, malignant disease of the gullet, &c., but in others the causative factor was indeterminable, and he had during the past three days been enabled to re-examine four of such cases with results which were interesting. The following is a brief summary of them :—

Case I.—F. W., male, aged 53, seen February 19, 1910. Symptoms: Hoarseness, two months, said to have been caused by " a bad cold and a touch of influenza." Laryngeal examination : Paralysis of dilator muscles of left side, the left vocal cord being in the middle line. No abnormal physical signs in the chest nor in the central nervous system. Laryngoscopic examination, May 1, 1913 : Both cords acting in normal fashion, and voice perfect.

Case II.—Captain H., aged 44, seen June 9, 1910. Symptoms: Hoarseness, one month's duration, "following a chill" ; "keeps wanting to cough to clear the throat." Laryngoscopic examination : Left vocal cord motionless in the middle line. No physical signs in chest, pupils equal, no sign of central nerve lesions. Laryngoscopic examination, April 30, 1913 : Larynx absolutely normal. The patient says that two months later the voice returned almost suddenly while " messing " in camp.

Case III.—Mrs. O. T., aged 42. Seen February 10, 1908. Symptoms : Difficulty in singing or speaking plainly, noticed for a fortnight ; otherwise no symptoms. Laryngoscopic examination : Right vocal cord motionless in the middle line. Sir John Broadbent could find no physical signs in the chest, and beyond a few slightly enlarged cervical glands on each side of the neck there were no lesions in the neighbourhood of the larynx or trachea. Laryngoscopic examination, May 2, 1913 : The larynx is normal, and both vocal cords move equally well on phonation and deep inspiration.

Case IV.—J. P., aged 62, male, seen May 26, 1910. Hoarseness, two months' duration. Laryngoscopic examination : Left vocal cord motionless in the middle line. This was confirmed by two other laryngologists. Sir Douglas Powell could find no evidence of any intrathoracic lesion, and skiagrams of the chest taken in Freiburg-im-Breisgau gave similar negative results. Laryngoscopic examination, Monday, April 28, 1913: The left vocal cord remains in the position of adduction. The voice is perfect, the patient's general health excellent, and he plays golf twice a week.

He added that he had been brought up to regard paralysis of a vocal cord in an adult as a matter for a grave prognosis, but in the light of his own experience, and of such cases as had been recorded by the aforementioned speakers, he felt that recurrent paralysis should always suggest grave possibilities rather than probabilities.

Dr. DE HAVILLAND HALL, in reply, said he would like to relate a case which Sir Felix Semon saw ten years ago. The patient came to see him (Dr. Hall) for life assurance. He had abductor paralysis of the left vocal cord, hence Dr. Hall could not recommend him for life assurance. He had to go to South Africa for business, and he came back a year later and insured himself, as he was well. Therefore, this unnecessary caution which had been observed caused a considerable loss of business to this young man. In answer to Mr. E. D. Davis as to the post-mortem appearances in cases of recurrent paralysis due to disease of the apex of the lung, or pleuritic thickening, there was only one case he could speak of, and that was not one observed by himself, and he had forgotten whether the evidence was clinical or post mortem. The neurological questions raised by Sir Felix Semon he would leave to Sir David Ferrier to answer; he had refrained from dealing with the neurological side.

Sir DAVID FERRIER, in reply, said he wished he was able to answer all the questions which Sir Felix Semon had put to him, but he did not think this was possible in the present state of our knowledge. It was certain, however, that the extensor muscles were first involved where a peripheral mixed motor nerve was the seat of neuritis. Why this was so, he could not say. Whether it depended on functional or reciprocal relationship, or the relative trophic strength in the nerve-centres, the same thing happened to the posterior crico-arytænoid in case of neuritis or pressure on the recurrent laryngeal nerve. No one that he knew had ever questioned the accuracy of the Semon-Rosenbach law. The point he wished to make in regard to tabes was that in the majority of instances there were clear indications of peripheral lesion. The cases in which central lesion had been described were vague, and the clinical symptomatology apparently so inconsistent, that he attached little importance to them. He thought the whole subject required re-investigation by modern methods. As to whether, in bulbar paralysis, the abductors were affected before the adductors would require examination at an earlier date than was, perhaps, usual; for, as was well known, the abductors might be paralysed before the voice was appreciably affected. He maintained, however, that on a due consideration of all the facts, tabetic laryngeal paralysis, in which the abductors only were paralysed, was most probably due to peripheral causes.

The rapidity of the pulse, so often seen in tabes, to which Dr. Watson-Williams had alluded, was no doubt due to implication of the inhibitory

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nerve of the heart, which arises from the same nucleus as the recurrent laryngeal. It might, of course, be due to central lesion, but, on the other hand, it might be accounted for by peripheral lesion, just as the recurrent laryngeal paralysis itself.

Dr. PERMEWAN, in reply, said he had been much interested in the cases described by the President and by Mr. Guthrie, but he thought it would be dangerous if members had the impression that there were a very considerable proportion of cases of abductor paralysis which was simply due to a functional or neuritic cause and were, therefore, recovered from. He feared it was likely that Dr. Watson-Williams's experience would be repeated, and that patients would often develop symptoms sooner or later of organic disease.

Laryngological Section.

June 6, 1913.

Mr. HERBERT TILLEY, President of the Section, in the Chair.

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Case illustrating the kindly Effect of Time in obliterating the Scars of Extensive Incisions for Operation on the Frontal Sinus.

By HERBERT TILLEY, F.R.C.S.

MRS. F., aged 60, was operated on by me thirteen years ago for chronic empyema of both frontal sinuses. The usual incision through each eyebrow was made—a vertical incision in the lower half of the mid-frontal region,—and these were joined by transverse incisions across the root of the nose, which joined the lower end of median with the inner end of the latter incisions. It was thus possible to turn upwards and outwards on each side a triangular flap which fully exposed the anterior wall of each frontal sinus. The nasal cavities are free from suppuration and the internal surface of one sphenoidal sinus is easily seen.

Adult Male with (?) Early Malignant Disease of Lower Pharynx and Upper End of Gullet.

By HERBERT TILLEY, F.R.C.S.

R. T., AGED 53, complained of difficulty in swallowing solids and loss of flesh, but no pain on swallowing. He says he had a large lump on the left side of the neck which "had been dispersed."

JY—10

Laryngoscopic examination reveals a small raised, flat swelling with free edges behind and just above the left arytænoid. Its surface is slightly paler than the surrounding mucosa and is not ulcerated. Examination by the direct method reveals a distinct ulceration on the left side of the hypopharynx, and apparently in direct continuity with the growth seen in the laryngoscope. One ulcer bled readily from the mere passage of the tube, which entered the gullet without any difficulty. There is a small, hard, easily movable gland behind the upper end of the left sternomastoid. Further, in the left base of the tongue is a smooth, circumscribed, slightly raised nodule about the size of an ordinary filbert. The movement of the tongue is quite free and probably this growth has nothing to do with that in the lower pharynx.

The case was seen hurriedly, and the patient is taking iodide of potash and mercury.

[Since the above notes were written I have made a careful examination of the patient by the direct and indirect methods. There is *no* growth in the hypopharynx, but the growth on the postero-lateral pharyngeal wall bleeds freely on being touched, and it is probable that it was the hæmorrhage from this which led me to think that there was ulceration in the hypopharynx.]

DISCUSSION.

The PRESIDENT (Mr. Herbert Tilley) said he would be glad to hear opinions as to the nature of this case. If one passed the direct tube into the upper end of the gullet, there was distinct ulceration which bled freely. The patient could swallow only liquid food. A hard gland could be felt behind the upper third of the left sternomastoid.

Mr. HARMER said he thought it would turn out to be malignant. He asked whether pieces of growth had been removed from the upper part of the œsophagus and from the tongue; also whether glands had been removed from the neck, because possibly the patient had more than one malignant growth, and, if so, cure by operation was hardly possible.

Dr. W. HILL said operation would have to be a formidable one, because the larynx and base of the tongue would also have to be removed. Mr. Evans once showed at the Section a case in which he did a very extensive removal, including about one-third of the œsophagus, glands, the base of the tongue, pharynx, and larynx. The patient not only recovered, but afterwards married. Food was conducted from a hole in the side of the pharynx by a rubber tube down to a gastrostomy opening.

The PRESIDENT replied that he only saw the patient for a few moments at the Radium Institute last week, but he asked him to come to this meeting. He was admitted to hospital on the previous day and would have his blood examined (Wassermann test), and probably a portion of the ulcer would be removed before any radical operation, which had not yet been definitely decided on.

Symmetrical Swellings on Anterior Aspect of Arytænoids just above the Vocal Processes.

By HERBERT TILLEY, F.R.C.S.

H. C., MALE, aged 30, complained that his throat gets dry after using his voice for a few minutes. No other symptoms.

On the anterior and median aspect of each arytænoid and above the level of the vocal process a small, pale, raised prominence can be seen. These come into contact on phonation, but do not interfere with the free movement of the arytænoids and the voice is not affected. The patient has had syphilis and been treated for the disease, but without any effect on the above appearances, which may be of the nature of pachydermia. Possibly the symptoms have nothing to do with the laryngeal appearances.

DISCUSSION.

The PRESIDENT asked for any views on the pathology of the case. He had an open mind on the subject, but suggested it was pachydermia. The patient complained of thirst, but there was no sugar in the urine, and no kidney disease was present.

Dr. H. J. DAVIS said the condition at first sight suggested papillomata, but on careful inspection the growths were found to be hard; on the left side was a cup-shaped depression into which the elevation on the opposite side fitted. He believed it to be pachydermia, and advised leaving it alone.

Sir STCLAIR THOMSON agreed with the diagnosis of syphilitic pachydermia. He was once deceived by a case somewhat similar, which turned out to be tubercle, but in it there was some abrasion or ulceration of one of the swellings. If he were the patient he would not have them operated on, but a scientific enthusiast might wish to remove a portion and examine it under the microscope.

Dr. JOBSON HORNE also considered that the excrescences might be of the nature of pachydermia laryngis and that syphilis was a causative factor. He

would be in favour of reducing the excrescences and of insisting upon absolute silence during treatment. The man's occupation permitted of this. The throat symptoms complained of could be accounted for by the nasal obstruction of which he complained, and attention to the latter would doubtless be beneficial both to the throat and to the larynx.

Dr. DONELAN said that viewed externally, in the absence of a speculum, the appearance of the nose suggested a deviated septum. The patient said that one of the reasons his throat was so dry was that he had much difficulty in breathing through his nose. Dr. Donelan would be glad to know how far this might be correct.

The PRESIDENT replied that the question of nasal obstruction was gone into, and it was concluded that there was not enough to indicate that it was a probable factor in the laryngeal condition.

Case of Osteoma of the Nose in a Woman, aged 31.

By H. LAMBERT LACK, F.R.C.S.

SHOWN at the Laryngological Society in 1904.[1] She had a large growth in the left nostril, completely distending it, pressing the septum over to the .right side, and occluding the ostium of the left antrum. The growth was removed by curetting and she has remained well until the last three months or so. Now there are signs of a return of the growth in the position of the left inferior turbinate and on the outer wall of the nose above the turbinate. During the last three months she has had some neuralgia on the left side of the face and some swelling of the left cheek. The left antrum is completely dark on transillumination. There is no discharge from the nose. The case is shown as being an exceedingly rare one and any suggestions for treatment would be welcome.

DISCUSSION.

Dr. JOBSON HORNE said the Section had been fortunate in having had brought before it similar cases during the last few years. The pathology, so far as he knew, had not been worked out, and the cases had not been classified. In the present case, although the growth was mainly on the left, the right side was also involved. The disease, according to his own observations, was usually bilateral. Speaking generally he thought the lesions were due to an infective process.

[1] *Proc. Laryng. Soc. Lond.*, 1903-4, xi, p. 112.

Dr. KELSON said that some years ago he showed a case resembling the present one, and they seemed to be allied in some respects to cases which occurred on the West Coast of Africa. The bone must have been quite soft, as Dr. Lack spoke of removing it with a curette. In his own case, though the bone appeared to be hard, it crumpled up when touched with a sharp instrument. The section showed simply thin bone, and there appeared to be no growth. He considered Dr. Lack's case to be of the same nature. Several somewhat similar cases had been shown in the last few years.

Dr. BOND did not consider there was anything wrong on the right side, but on the left there was considerable thickening about the canine fossa, and a large mass in the nose. The history seemed to point to a growth beginning on the inner wall of the antrum, and if the antrum were opened up, either by cutting alongside the nose and through the upper lip, or lifting up the nose and cheek, one could see what should be done. He thought it would be necessary to make a cut to the internal angle of the orbit. Possibly the whole upper jaw would have to be removed.

Mr. E. D. DAVIS asked whether Dr. Horne and Dr. Kelson referred to the condition of hyperostosis cranii. There had been eight of those cases shown in which there was enlargement of other bones, including the maxilla, the nasal processes, both sides of the nose, the temporal bone, mastoid, and exostosis of the ear. Dr. Lack's case appeared to be localized to the nose, and was not hyperostosis cranii.

Sir StClair THOMSON said he only wanted to discuss the case from the standpoint of operation. It had been suggested that the upper jaw should be removed, but if a radical operation were contemplated, why remove the upper jaw? It would mean removal of the alveolar border, and result in disfigurement, and it did not bring the operator very near the site of disease. He asked that Moure's operation (lateral rhinotomy) should be considered. He had introduced it to one or two general surgeons, one of whom, Mr. Burghard, said he did not think he would ever again remove the upper jaw. By entering below the eye and cutting through the ascending process of the superior maxilla, there was free access to the antrum, nose and sphenoid, without disfigurement of the patient. It also preserved the teeth, and there was not much bleeding caused.

Dr. LACK, in reply, said his idea was to turn up the upper lip and reach the outer wall of the nose in that way, as it was the lower part of the nose which was affected.

Chart and Brief Notes of a Case of Cavernous Sinus Thrombosis following Left Tonsillitis in a Boy, aged 10 ; Fatal Termination in Eighteen Days.

By H. J. DAVIS, M.B.

THE chart is exhibited showing oscillations of temperature varying from 98° to 106° F.   The highest point reached was 107° before death, when the pulse-rate was 176 ; on the fourteenth day of illness only 7 oz. of urine were passed.
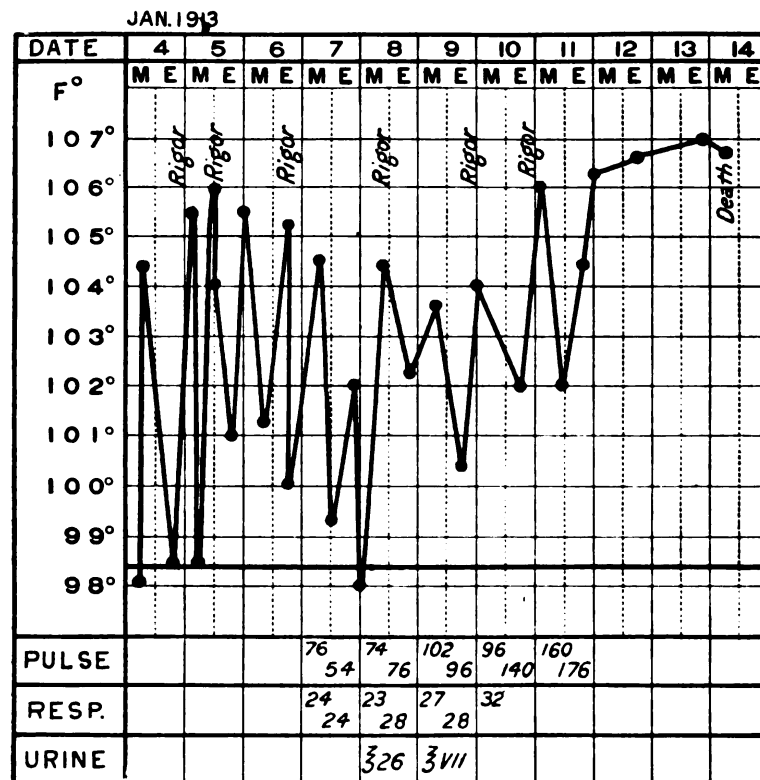
Temperature chart of case of cavernous sinus thrombosis.

This case, a private one, I saw in consultation with Dr. Simpson and Dr. Watson, of Tunbridge Wells, on the evening of January 9 ; the boy had been ill for fourteen days, and he died four days later. Extracts from the notes of the case as kindly given to me by Dr.

Simpson, who first attended the child on January 1, are briefly as follows :—

The patient, a fine, healthy boy aged 10, who was home for his Christmas holidays, developed on December 27 a unilateral parenchymatous tonsillitis. His two brothers had previously been laid up in the same house with follicular tonsillitis. This had run its usual course.

On January 3 the temperature was 104° F., with rigors, and these continued in spite of all treatment until he died on January 13, the temperature being 107° F.

January 5 : Antistreptococcus serum was injected by Dr. Watson, and the next day he again incised the palate and tonsil, and on January 7 incision was made in the neck, but no pus was found.

January 8 : Swab taken from the wound, and blood taken from elbow vein ; swab was sterile, but after prolonged cultivation *Staphylococcus albus* was found in the blood.

I saw the child on January 9, and the diagnosis of cavernous sinus thrombosis was obvious. The eyelids were œdematous and tightly closed over the eye, which was bulging, there was ecchymosis of the conjunctiva, and œdema had spread to the forehead and face from blocking of the facial vein, and extended down the neck. There was little to be seen in the throat except that the left tonsil was red and slightly enlarged. Incisions were made in the palate, face, neck and eyelids, and the conjunctiva was also incised and 5 minims of liq. ammoniat. fort. administered every two hours in water. Oxygen, saline infusions and strychnine injections also administered.

January 10 : Twitchings and paresis of the leg supervened ; lumbar puncture fluid clear ; 4 c.c. drawn off, apparently not under pressure. Fluid sterile and did not reduce Fehling's solution.

Child died on January 13.

With reference to the administration of strong ammonia, which it is known reduces the liability to thrombosis, Dr. Simpson says : "It is possible it prevented the spread of thrombosis across the circular sinus to the right cavernous sinus, since symptoms of affection of the latter appeared, but did not progress."

In the only other two cases of cavernous sinus thrombosis following tonsillitis which I have seen, in one the patient recovered but was blind, and the other, a soldier, died on the fifth day. In each case the affection was unilateral.

At a meeting of the Otological Section on November 18, 1910,[1]

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[1] *Proceedings*, 1911, iv (Otol. Sect.), pp. 27 and 28.

I reported a case of double cavernous sinus thrombosis. The patient was a woman, aged 36, with intracranial suppuration following mastoid disease. She died on the fifth day after operation.

DISCUSSION.

Mr. O'MALLEY asked what suggestion Dr. Davis had to make as to the route of spread of the infection from the tonsil to the cavernous sinus. He knew of a case in which the cavernous sinus became involved three weeks after the removal of tonsils and adenoids. The patient died and the post-mortem examination showed the tonsillar and adenoid regions fully healed, and the presence of an osteo-myelitis of the body of the sphenoid, which involved the sinus by direct spread along the optic nerve on one side. In the present case there might have been another focus of infection besides the tonsil, which would account for rigors and high temperature, even before invasion of the sinus.

Sir StClair Thomson said he had seen only three cases of thrombosis of the cavernous sinus. In two the spread was from the sphenoid, and the third was an ear case. He agreed with Mr. O'Malley that it was difficult to trace the route from the tonsil. The histories seemed to suggest that the same infection which attacked the tonsil got located in the sphenoidal sinus, and that even in so-called tonsil cases the thrombosis was really of sphenoidal origin.

Dr. Jobson Horne recalled a case in which there was no external indication of infection, but post mortem the sphenoidal sinus was found to be infected, and that fully explained the condition.

Dr. W. Hill asked what line of surgical treatment should be adopted in cases of cavernous sinus disease if one were asked to do something more when vaccines failed. The sinus was awkwardly situated, but it could be got at either through the skull or through the orbit or through the sphenoidal sinus. He wondered whether it had been found useful to turn out the clot and drain. Had anyone found that frequent doses of ammonia were of definite use ?

Dr. FitzGerald Powell said that he had had a case of cavernous sinus thrombosis following *intercranial suppuration*. The petrous portion of the temporal bone was found extensively necrosed, and the superior petrosal sinus was also thrombosed. Thromboses of the pterygoid plexus of veins were usually responsible for cavernous sinus thrombosis in infection from throat. He believed the sinus had in some cases been approached through the pterygo-maxillary fossa.

Dr. Dan McKenzie said Dr. Hill's point would be found dealt with in a recent number of the *Lancet*[1] in an article by Mr. Ballance, being a paper read by him at the International Congress of Otology, Boston, last year

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[1] *Lancet*, 1912, ii, pp. 1001-5.

Dr. H. J. DAVIS replied that the severity and the circumstances of the case made a great impression on him. The boy had what was called "an ordinary sore throat" with a small ulcer on the left side. He saw the child nine days after he became ill. He believed the infection of the cavernous sinus travelled through the facial vein, as it communicated by the angular vein with the ophthalmic vein in the orbit. The œdema of the face was due to plugging of the facial vein. He did not know whether there was trouble in the sphenoidal sinus, but there was nothing to suggest it. Strong ammonia certainly reduced the liability of the infection to spread; that was seen also in jugular sinus thrombosis in which the jugular was not tied, and in femoral thrombosis and thrombosis elsewhere in the body. It lessened the tendency to coagulation.

Mr. WHALE said that the route was tonsil, pterygoid plexus, facial and angular veins; and then via the ophthalmic vein as had just been suggested.

Unilateral Paralysis of Left Cord, Tongue and Palate, in a Man, aged 49. ? Cause.

By H. J. DAVIS, M.B.

THE patient, a healthy-looking man, had a history of three weeks' increasing difficulty in swallowing, and the case was supposed to be one of early œsophageal growth. It will be seen that the left side of the tongue is atrophied and paralysed; the same applies to the palate and the same to the left side of the larynx. The dysphagia is probably, therefore, due to muscular weakness. The patient attributes his trouble to a heavy blow on the left side of the head. Dr. Grainger Stewart, who has examined the patient, thinks it is not a case of syringomyelia, but that the implication of the cranial nerves is due to a meningitis, probably specific. The patient is not very easy to examine.

DISCUSSION.

The PRESIDENT remarked that similar cases had been shown before. Some years ago he had shown two cases: (1) A patient suffering from syringo-myelia in which there was paralysis of the right vocal cord, of the right half of palate and pharynx, the right sternomastoid and upper third of trapezius. (2) A male, with paralysis of left vocal cord, left sternomastoid and upper third of trapezius. This was probably due to a basal pachymeningitis. Similar cases had been previously recorded by Hughlings Jackson and Morell Mackenzie.

Dr. H. J. DAVIS, in reply, said that a Wassermann test was found to be faintly positive: he had just received the report.

Perforating Ulcer of the Palate in a Man, aged 63.

By W. H. KELSON, M.D.

PATIENT (a clerk), who denies syphilis, says he first noticed a small sore on the roof of his mouth eighteen months ago. Six months ago he went into hospital and had three doses of neo-salvarsan, 2·4 grm. in all, and on leaving the Wassermann test was negative. He then gave up treatment for some months. The ulceration, however, still went on, and he became much troubled with food passing up into his nose. He then became a patient at the London Throat Hospital, and is now taking perchloride of mercury and iodide of potassium. A large funnel-shaped ulcer of the hard palate is present, which passes up into the cavity of the nose.

DISCUSSION.

The PRESIDENT said that two or three years ago there was a somewhat similar case at University Hospital. The man was medically treated with antisyphilitic remedies, as well as calomel inhalations. The Wassermann test, however, was always negative; and yet the appearance was so much like that of syphilis, that the treatment mentioned was continued. The patient died, and the disease was proved to have been chronic glanders. In this case the whole soft palate was eaten away so that one looked up into a dome in the nasopharynx. Dr. Kelson's patient said he had had a good deal to do with horses, but not with any which were suffering from glanders.

Dr. JOBSON HORNE said the localized nature of the growth and its duration were against it being glanders, as suggested by a previous speaker. The appearance of the ulceration was unusual in that situation and reminded one of so-called "rodent ulcer." However, the enlarged and hard lymphatic gland beneath the angle of the jaw on the right side suggested malignancy.

Dr. KELSON replied that he would follow up the President's suggestion. Dr. Graham Little suggested to him that a portion of it should be removed for examination, as he thought it might be malignant or tubercular.

Lupus of the Gums and Pharynx in a Man, aged 40.

By W. H. Kelson, M.D.

Patient, who denies syphilis, states that his throat first felt sore about seven months ago, but says he now has no pain on swallowing. On examination ulceration and a nodular condition is seen on the gums, right tonsils, palate and pharyngeal wall. Marked improvement has taken place since he has been put on arsenic, and incidentally a very irritating skin eruption from which he had suffered for several years has disappeared.

DISCUSSION.

The President noted that the gums were most diseased where the pyorrhœa was most marked. The teeth certainly needed attention.

Dr. Jobson Horne had detected a similar lesion in the inter-arytænoid region of the larynx of the patient.

Dr. Kelson replied that there had been much improvement since the patient had been taking arsenic. He could now swallow in comfort, whereas previously he had been in considerable pain. He believed it was lupus.

Case of Laryngeal Disease presenting Atypical Features.

By W. Jobson Horne, M.D.

The patient, a kitchen porter, aged 36, two years ago was under treatment for neurasthenia. Fifteen months since he underwent a nasal operation for the relief of tinnitus aurium. When he came under the exhibitor's notice he sought relief for post-nasal discharge and sore throat, and stated that he had been losing weight (four to eight stone in six to eight months).

The left vocal cord was hidden by the left ventricular band. The movement of the cords had been irregular, the left appeared to move with a greater effort than the right cord. The question for discussion was the nature of the laryngeal lesion.

A sister had died from consumption. The examination of the thorax and the sputum was negative. A Wassermann test had not been done at the time of writing this note.

DISCUSSION.

Sir StClair Thomson said he looked carefully for the atypical feature, but he could not see it. He saw one ventricular band more prominent and slightly overlapping one vocal cord, but he did not regard that as more than a physiological abnormality.

The President said that the day before he was consulted about a similar case. The patient had been speaking in public a good deal, and his physician saw the left ventricular band rather overlapping the corresponding cord. He (the speaker), gave the opinion that the appearances were within normal physiological limits.

Dr. W. Hill suggested that there was probably present a condition of hyperplasia of the lining membrane of the ventricle, although there was not as yet a projection from the ventricle.

Dr. Kelson suggested it might be slight laryngitis, such as one would expect to see in a man who suffered from post-nasal discharge.

Dr. Jobson Horne, in reply, regretted that he had not received the report on the Wassermann test. He certainly did not consider that the appearances which the larynx presented should be passed over as being within the normal physiological limits. The laryngeal appearances fluctuated from time to time, and he would report further on the case.

Case of Double Paralysis of the Superior Laryngeal Nerves in a Man, aged 25, in the Course of Disseminated Sclerosis from Lead Poisoning.

By James Donelan, M.B.

This man was first seen as an out-patient in the throat department of the Italian Hospital on June 19, 1912. He gave a history of pleurisy at the end of the previous October, since when he had been losing weight and presented a thin, sallow appearance. He had a husky voice and a small, white, lenticular swelling about 3 mm. diameter at the juncture of the right vocal cord and vocal process. He had some soft râles over both upper lobes. The case was regarded as probably one of tuberculosis and was entered in the case-book as laryngeal tuberculosis with a query. At the request of his relatives an effort was made to get him into a sanatorium and he went to one on September 14, remaining there until November 9, when it was decided that the case was not one of tuberculosis. The patient went to the London Hospital on January 8, where he was seen by Dr. Head, who regarded the case at that time as showing distinct signs of disseminated sclerosis.

Dr. Lambert Lack, who examined him about this time, found there was no laryngeal abnormality. He remained under treatment at the London Hospital until March 5, when, finding his voice getting very much worse, he returned to the Italian Hospital. It was then found that both crico-thyroid muscles were paralysed, but there was no paralysis of the recurrents. Abduction and adduction are unimpaired and the patient possesses a loud, rough voice, being able to shout, but the tone and ring of the normal voice are absent. He is a fairly easy subject to examine and the wavy outline of the glottis is very characteristic. There appears to be some slackness of the arytæno-epiglottidean folds. There is scarcely any movement of the cricoid cartilage towards the thyroid during phonation.

The patient's appearance was, and continues to be, greatly improved by his sojourn at the sanatorium. He has been continuously treated with strychnia and iodide of potassium since March without any change in his general or local symptoms.

When this man first came to the Italian Hospital he was described as a porter, and in the few minutes during which he was examined no allusion was made to the exact nature of his employment that would have suggested further inquiries. It now appears that he was a printer's labourer, occasionally employed on small jobs of type-setting, such as the titles of books. He had also a good deal to do with the handling, cleaning, and forwarding of frames of type already set to other works of the large firm by whom he was employed. He was a perfectly healthy man when he entered the employment of this firm four years ago and continued to be so until the attack of pleurisy in 1911, which seemed to have diminished his previous resistance to lead-poisoning.

Tonsil Forceps for holding the Tonsil during Excision or Enucleation.

By James Donelan, M.B.

This instrument is on the principle of the Krause wool-holder and permits the passage of any snare or tonsillotome after the grasp has been secured. It is made to grasp the tonsil in a vertical direction as suggested by Ballenger some years ago. Instead of teeth, which are so often apt to tear the tonsil, it has two grooved rings like a tongue forceps. It has proved very useful in the removal of stumps and embedded tonsils.

Sinusitis Exulcerans of the Frontal Sinus; Operative Trauma of the Dura; Recovery.

By Dan McKenzie, M.D.

THERE are two points of interest in this case; first, the injury to the dura and (?) the frontal lobe of the brain, and secondly, the protracted course of the case.

The patient, a female, aged 66, was sent in August, 1912, to the Central London Throat and Ear Hospital from the Western Ophthalmic Hospital, whither she had gone on account of a small, painless swelling under the left supra-orbital margin of a few days' duration. There was no history of any discharge from the nose, and when I came to examine her no pus could be seen in any part of the nasal cavities. Nevertheless, the swelling, which had now spread to involve the whole supra-orbital region and upper eyelid, was obviously due to frontal sinus suppuration, and the patient was admitted for operation.

Following the classical rule, the first operation was to have been limited to simple opening and drainage of the sinus. But early in the proceedings the dura was wounded in a curious manner. After making the first incision through the eyebrow down to the periosteum, whereby a quantity of pus was evacuated, I proceeded to elevate the pericranium over the site of the sinus from off the anterior surface of the frontal bone by slipping an elevator under the pericranium so as to lever up that structure off the bone. But the bone was like wet pasteboard, and, in the act of levering the end of the elevator plunged through the anterior wall of the sinus, and—as subsequent examination showed— through a sinus full of pus, through its posterior wall, which was thin but healthy, and through the dura !

Continuing the operation, I found that all the walls of the sinus (save the posterior) had undergone or were undergoing disintegration— the " bridge " and intersinus septum included. I therefore had to clear away all these parts, and, after this was done, the fractured posterior wall lay exposed to view. This wall I also removed with cutting bone-forceps and revealed a tear in the dura about 3 mm. in length. The dural tear was then enlarged until the cerebrospinal fluid began to flow freely. Finally, a gauze drain was inserted between the lips of the dural wound, and the sinus, &c., was lightly packed with iodoform gauze.

Save for a violent headache next day, the patient showed no sign of

intracranial damage, and fears of trouble from the accident soon subsided. The frontal sinus wound, however, continued to discharge, so that about six weeks later the Killian operation, necessarily modified by the previous extensive destruction of bone, was undertaken. It was found necessary to fashion an artificial infundibulum as there seemed to be no indication of the presence of that duct, and a drainage tube was inserted to maintain the channel into the nose, the skin wound being entirely closed. But this attempt failed. So violent was the local reaction induced by the tube that we had to remove it, and, in consequence, nasal drainage came to a standstill and the external skin-wound opened up again. (This operation showed the dural and inter-sinus septal openings soundly healed.)

The sinus wound went on discharging pus for several months longer, and then a third operation was performed. On this occasion softened bone in the direction of the external angular process was removed. This operation also failed to stop the discharge. And it was not until the fourth operation (February 3, 1913), when I discovered a long, fine "gallery" running back in the orbital roof almost to the optic foramen and removed its floor, that the sinus began to heal. At this operation a second attempt to constitute an infundibulum was made, because it was obvious that if the sinus had to heal up independently of nasal drainage it would be impossible to close the skin wound and deformity would result. But this attempt failed like the others, because the tube could not be tolerated. The sinus is now entirely obliterated and, we hope, finally healed. The deformity is great, but so was the bony destruction. In any case, I do not propose to perform any plastic operation.

Attention is drawn again to the accident to the dura (and doubtless to the brain) and to the advisability of exposing and enlarging such wounds so as to institute a free flow of cerebrospinal fluid.

DISCUSSION.

Dr. McKENZIE added that the patient had no recollection of what happened on the day of the operation; and in cases of head injury he had noticed it as a frequent circumstance attending concussion of the brain that the patient did not remember what had taken place during the several hours previous to the accident. He wondered, therefore, whether the injury in this case had sufficed to obliterate all memory from the brain relating to the events of that day.

The PRESIDENT said that on Whit Sunday he was called to the University College Hospital to see a similar case, in which there was an acute exacerbation of chronic frontal sinus empyema. He made the usual incision through the eyebrow, and inserted an elevator to raise the periosteum from the front wall of the sinus, but the bone composing that wall was so soft and infiltrated by inflammatory products that it broke away with the periosteum and thus the sinus cavity was at once exposed in its whole anterior extent. The patient had made an uninterrupted recovery. The posterior wall of the sinus was healthy.

Dr. H. J. DAVIS said he did not see the object of always removing the floor of the sinus. The best way of making an infundibulum larger was with a drill, and he did not think such a cavity ever closed up. It left a hole large enough for the house surgeon to pass in a catheter and wash it out. Patients got well without the floor of the sinus being removed, and there was less risk of injury to the eye.

Major MOORE said the patient had made an excellent recovery from her very serious illness. It would seem a pity that so large a degree of deformity should remain. Did Dr. McKenzie at a later date propose, by paraffin injection or other means, to lessen this?

Dr. McKENZIE replied that the patient was aged 66, and she had come through a serious illness. But if she were to express her desire to get married he would do his best to improve her appearance. As she did not contemplate that step at present, he would leave her alone, as he had a dread of that particular frontal sinus. The Killian operation was done, and the infundibulum made. The moment the skin was put back, there being no bridge to support it, it collapsed back on the gutter, and nothing which could be subsequently done enabled an opening to be made right down into the nose. He removed the floor of the gallery because he hoped the contents of the orbit would come up and obliterate the gallery. That was, he believed, what occurred. He applied to the little gallery the same treatment that Killian applied to the frontal sinus itself in his radical operation.

Death after Tonsillotomy.

By DAN McKENZIE, M.D.

THE patient, a boy, aged 9, was brought to the Central London Throat and Ear Hospital on March 6, 1913, for the removal of enlarged tonsils and adenoids. The presence of sub-acute and middle-ear catarrh, with some fever (temperature 101° F.), led to the postponement of the operation on the throat for five weeks. At the end of that time he was

considered to be sufficiently well. Tonsils and adenoids were, therefore, removed in the out-patient department under ethyl chloride anæsthesia on April 16, 1913, the simple tonsillotomy operation being performed.

Three days after operation he returned to hospital with a temperature of 103° F.; great œdema and swelling of the left side of the neck below the left angle of the jaw, together with redness, swelling, and a sloughy condition of the left side of the palate and pharynx. His facies was ominously septic. An incision was at once made under chloroform into the œdematous cervical swelling, and a great quantity of fœtid pus delivered by Hilton's method from the deeper structural planes of the neck.

Next day the boy looked better. The cervical œdema had disappeared, the faucial inflammation had subsided, and the patient could phonate, swallow and breathe without difficulty. The temperature was lower, oscillating between 99·2° and 102° F. On the following morning, however, he was suddenly seized with violent pain in the left side of the chest, the respirations rose to 30 in the minute, friction could be heard, and his strength began to fail. Eighteen hours later he died.

Post-mortem : Double pneumonia and pleurisy, with double empyema; pericarditis and pericardial effusion. The organisms obtained both from the cervical abscess and from the pleural cavity were of the same type as those which normally inhabit the mouth and pharynx— *Spirochæta dentium*, &c. The patient's teeth were all sound.

The exhibitor has operated on rather more than 3,000 cases of tonsils and adenoids. Of these three have died, including the above case : one from the anæsthetic (nitrous oxide), and two from sepsis. In both of the septic cases the infection seemed to have originated in the mouth. I make it a rule to precede this operation with the use for some days of a 1 per cent. solution of lysoform as a mouth-wash and gargle.

It is noteworthy and perhaps significant that in the case just recorded this precaution was accidentally omitted.

DISCUSSION.

The PRESIDENT said the Section would feel grateful to Dr. McKenzie for recording the case, because one often heard a parent remark. " The operation is nothing, is it ? " Members of the Section knew the operation was not without risks, and that there were many evil possibilities, which, fortunately, did not often happen.

Dr. JOBSON HORNE, referring to the bacteriological findings, " *Spirochæta dentium*, &c.," as given in the notes of the case, considered that the presence of
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the *Spirochæta dentium* was a coincidence and not the cause of the death. The latter he considered was contained in the "etcetera," and was probably a pneumococcus infection and associated with the middle-ear disease. The use, or the omission of the use for some days previous to the operation, of a 1 per cent. solution of lysoform as a mouth-wash and gargle would in no way have affected the result of the operation.

Dr. DONELAN congratulated Dr. McKenzie on having brought the case forward. He hardly thought, however, that death should be attributed directly to the effects of tonsillotomy. It was more probably due to an inter-current pneumococcal infection. It would doubtless be remembered that the pneumococcus was much the prevailing organism throughout the months of April and May. Its virulence in this case may have been intensified by symbiosis with the *Spirochæta dentium.*

Dr. H. J. DAVIS said that two years ago an out-patient, aged 7, died eight days after such an operation, of septic pneumonia, and with enlarged glands on each side of the neck. It was not unusual for out-patient operation cases to be laid up with bronchitis, and the condition of the throat became septic if they did not receive careful subsequent attention at home. His practice was to order them to be kept three days in bed and another three days indoors. He did not think the omission of the lysoform had anything to do with the fatal result in Dr. McKenzie's case.

Dr. McKENZIE replied that he was prepared to stand by his contention that the *Spirochæta dentium* was the probable cause of the death. Still, that reference was purposely made vague in the report, as he could not be absolutely sure. The omission of the lysoform, and the presence of the organisms in the neck and in the thorax, all hung together in a chain, and pointed to the mouth organisms as the cause of death. This Section was a clinical, not a pathological one, and so it could do no more than suggest that a certain organism was the cause. But such suggestions might stimulate pathological research. He joined issue with Dr. Donelan when he remarked that it might be intercurrent pneumonia, because he (the speaker) contended that a septic pneumonia which occurred within a week of the operation was due to the operation, and should be so recorded, both for their own sakes and for the sake of the public.

Goitre with Severe Pressure Symptoms. ? Malignant.

By Dan McKenzie, M.D.

THE patient is a woman, aged 73. The goitre has appeared within the last three years. It is nodular and rather hard. There is tracheal stridor and some difficulty in swallowing. The left cord is paralysed; the trachea can be seen to be narrowed; the external jugular vein is greatly enlarged; and there are some enlarged glands in the left supra-clavicular region.

DISCUSSION.

Mr. HARMER did not think the evidence was clear that it was malignant disease. The difficulty of breathing and swallowing might be caused by the fact that it travelled down into the thorax behind the sternum, and if she were well enough he would take out a piece of the growth and ascertain its nature. If not malignant, she should be given the opportunity of thorough removal of the left half of the gland.

The PRESIDENT said he had seen a patient who had paralysis of the left recurrent nerve, with difficulty in swallowing ; the case was transferred to Mr. Berry, who operated upon her, and removed a large dermoid cyst from behind the manubrium sterni. In the patient shown to-day the thyroid was rather soft, whereas the malignant tumours of this gland which he had seen had usually been extremely hard.

Dr. McKENZIE replied that he thought it was malignant because it was a small goitre, and yet there was not only· dyspnœa, but also dysphagia, paralysis of the recurrent laryngeal and blockage of the internal jugular vein. But there was some support for the other view, and he would do as Mr. Harmer recommended. Two years ago he had a case of what appeared to be a thyroid, which was pulsating, and hæmorrhage was expected ; but it turned out to be a mediastinal dermoid presenting in the neck. It did not permit of removal, and a sinus was left open in the neck, discharging dermoid material.

Endothelioma of the Soft Palate in a Girl, aged 17.

By Dan McKenzie, M.D.

THE growth appeared in the nasopharynx in clusters of polypoid-looking masses. Three operations have been performed. In the last a fortnight ago the external carotid was tied, and the soft palate removed. But it was found impossible to remove the whole of the growth as it had extended to involve the lateral wall of the naso-pharynx.

DISCUSSION.

The PRESIDENT said he had seen seven such cases, and he hoped he would never see another ; they were amongst the most disappointing and sometimes tragic cases one could meet with. He had seen them early, when there was only a little deafness or a little anæsthesia over the lower division of the fifth, and a little immobility of the levator palati. Mr. Trotter had done extensive and very complete operations on some of his cases, but he feared that no case had been cured. Convalescence was long and very trying and early recurrence usual.[1]

Dr. H. J. DAVIS said Mr. Harmer's treatment by diathermy might be used here. He had sent a case to St. Bartholomew's Hospital for that treatment, after Mr. Harmer had exhibited his cases last year.

Mr. HARMER said ten cases of malignant growth of the palate had been treated at St. Bartholomew's Hospital by diathermy. One was still well, eighteen months afterwards, and had been exhibited. There was not much difficulty in the operation, and not much soreness afterwards. He was doubtful if the present case could be cured.

Dr. W. HILL said Mr. Trotter had recorded several of these cases. He had seen two bad cases in which the tumour temporarily disappeared when treated with radium. In a case referred to him by Mr. Martineau the tumour was so large that the palate was pushed forward nearly to the teeth, and the patient could neither hear, swallow nor breathe. Five tubes totalling 250 mg. were used for about forty hours, and the whole soft mass disappeared, though the invasion of the bone in the region of the pterygoid process remained, as evidenced by ulceration and some pain. Hearing became normal in one ear,

[1] Since the above meeting I have seen another advanced case in consultation and large doses of radium are to be tried.—H. T.

and greatly improved in the other, swallowing became normal, and the patient was able to dispense with his tracheotomy tube at the end of a week. The patient lived six months, but there was eventually marked involvement of the maxilla, &c. Mr. Graham had an identical case in which after one similar application of radium the whole growth disappeared, and there was no recurrence a year after.

Mr. KISCH suggested that Coley's fluid might be tried in this case, starting with a very small dose, and working up.

Dr. McKENZIE replied that he did not think any of the remedies suggested would make much difference in this case, because when he tied the external carotid, he had removed some glands which were found to contain growth. The patient came complaining simply of nasal obstruction, and he saw what looked like polypi in the nasopharynx. On putting his finger in, he found they sprang from the upper surface of the soft palate. The pathologist reported at first that they were simple nasal polypi, but further investigation revealed their true nature.

A Specimen of a large Polyp growing from the Tonsil.

By E. D. DAVIS, F.R.C.S.

THE patient, a man, aged 21, said that he could see something growing from his tonsil, but there were no symptoms. The pedicle of the polyp was crushed with artery forceps and the polyp cut off. A sketch of the condition before removal of the polyp, the specimen, and a microscopic section were shown.

DISCUSSION.

The PRESIDENT said Mr. Arthur Cheatle had shown a similar case in which the growth hung out like a polypus from one of the crypts in the tonsil. They nearly always grew from the region of the intratonsillar fossa.

Mr. E. D. DAVIS replied that the section showed epithelium covering the polyp, and there was fibrous tissue, and fat, as well as adenoid tissue.

An Unusual Condition of the Nasopharynx.

By J. H. CONNOLLY, F.R.C.S.

PATIENT, a woman, aged 32, under the care of Mr. Sydney Scott at St. Bartholomew's Hospital for suppurative otitis media believed to have begun about three years ago. No complaint directly referable to nasopharynx now.

Description: Passing upwards and backwards from Eustachian cushion on either side and meeting across vault of nasopharynx is a fringe of mucous membrane, which might be compared to the peripheral remains of a diaphragm. It presents two small perforations, one on either side. There is a distinct interval between posterior edge of septum nasi and the fringe.

DISCUSSION.

Dr. JOBSON HORNE said that when the condition was unilateral the question of traumatism had been raised.

Dr. McKENZIE said it looked like scar tissue.

Dr. H. J. DAVIS considered it was scar tissue from a gumma in the post-nasal space.

Mr. CONNOLLY expressed the opinion that the structure was congenital in origin.

Malignant Disease of the Œsophagus; Complete Paralysis of the Left Recurrent Nerve.

By E. A. PETERS, M.D.

H. W. F., AGED 43, carpenter, suffered with a severe attack of influenza eight weeks ago. Twenty days ago the voice suddenly lost strength and became hoarse. For eight days there has been inability to swallow solid food. The left cord is completely paralysed; it is curved and lies in the cadaveric position. The left arytænoid is slightly pushed forward and rotated, so that the vocal process is prominent and gives the sickle-shaped appearance to the cord. A bougie passes only $8\frac{1}{2}$ in. from the teeth and an enlarged gland can be felt above the left clavicle. Nothing abnormal was found on examining the heart and lungs.

DISCUSSION.

Dr. W. HILL said he had seen a number of malignant cases in which the dysphagia was of quite sudden onset. The revealing signs of cancer of the œsophagus were very late. Sometimes even with considerable stricture the patient could swallow well, and in most instances the disease was quite advanced before anything was suspected of being wrong, especially when thè disease was too low to cause laryngeal paralysis. His diagnosis of advanced malignant stricture based on endoscopy had often been received with scepticism in cases where patients were brought for the relief of a sudden impaction of a large portion of meat or vegetable in the gullet where there had been no previous symptoms whatever of dysphagia.

The PRESIDENT mentioned a case in which the dysphagia seemed determined by a hearty laugh, and next day the patient was found to be unable to swallow solid food. Until this symptom arose he did not think he was in anything but perfect health.

Case of Ulcer of the Pharynx.

By H. A. KISCH, F.R.C.S.

PATIENT has had a sore throat for two months. The glands in the neck have been enlarged about the same time, but both sides are said to have been involved at first. The throat has been treated by her doctor with antiseptic gargles, and gets better at times, but has never become quite well. A small elongated ulcer is seen on the lateral wall of the pharynx, on the left side just behind the posterior pillar of the fauces. The base and edges are firm to the touch, but not everted or indurated. There is a chain of glands in the left posterior triangle, the upper glands being the larger, and they appear to be inflammatory in nature. A portion of the posterior edge of the ulcer has been removed for examination and the report has just been received from Dr. Bernstein that the section of the wall of the ulcer simply shows an inflammatory condition.

The patient is aged 24, has had two children and no miscarriages.

Note.—The Wassermann reaction was positive. The ulcer is healing and the glands diminishing in size with antisyphilitic treatment.

Recent Laryngeal Perichondritis with Stenosis.

By William Hill, M.D.

Dr. Hill said the man was first shown as a case of escharotic stricture of the deep pharynx and gullet after swallowing glacial acetic acid ; later as a laryngeal case with impaired abduction, probably due to myopathic injury, and now he showed it as laryngeal stenosis, obviously associated with perichondritis. The latter had come a month ago. Intubation of the gullet had been discontinued for a considerable time previously. The patient was now wearing a tracheotomy tube and taking iodide of potassium. If he were treated by intubation probably an abscess would form. There had not been more than a slight nocturnal elevation of temperature, for a few days at the most, and he did not suspect it as being streptococcal, but it might be latent chronic pneumococcal disease. There were no tubercle bacilli or any other pathogenic organisms found in the discharges, and the Wassermann reaction was negative. As there was evidence of much external thickening of cartilages as well as internal stenosis it was possible that an abscess might appear later and clear up the diagnosis. He was quite unable to explain the sequence of events.

Brain with large Pituitary Tumour in situ.

By William Hill, M.D.

The case was described at the March meeting of the Section.[1] The specimen was now shown mounted in gelatine, which prevented detachment of the tumour from the brain in handling the glass jar. Dr. Spilsbury had slightly tinted the gelatine pink to endeavour to overcome the yellow colour which the gelatine assumes in course of time, and which tends to diminish the natural coloration of the specimen secured by the Kaiserling process.

A slice has been removed from the surface of the right half of the tumour to show extravasation of blood into the substance of the tumour from operative perforation. This led to the formation of a large hæmatoma beneath the capsule and caused death by increased intracranial pressure.

[1] See *Proceedings*, p. 103 *et seq.*

The PRESIDENT reminded members that uncontrollable hæmorrhage occurred, and the consequent intracranial pressure proved to be the undoing of the patient. The flattening of the convolutions showed how severe the pressure had been.

Tumour of Superior Maxilla.

By WALTER HOWARTH, F.R.C.S.

THE patient has noticed a swelling of the right side of the face for six months. There has been no discharge from the nose and only bleeding on one occasion three weeks ago. There is no pain. There is no pus in the antrum. On transillumination there is a dark shadow on the right side, whilst the X-ray plate shows the region to be more opaque than the left side. There are no unerupted teeth.

An exploratory incision was made in the labio-gingival fold and the periosteum raised over the swelling. The surface of the tumour was smooth and gradually shaded off into the maxilla, so that it was impossible to say which was tumour and which maxilla. Considerable portions were chiselled away and presented the appearance of rapidly growing bone. Microscopic sections show a condition of chronic osteitis with considerable rarefaction.

Ulceration of Hard Palate on Right Side and Mass under the Tongue on Left Side.

By W. M. MOLLISON, M.C.

J. C., AGED 71, attended the Out-patient Department at Guy's Hospital, on the advice of Dr. Heald. History: He has noticed a small lump under the left side of the tongue for some twelve months; it has slowly increased in size and is painless, though bleeding now and then. He has noticed pain in the left parotid and submaxillary regions during eating. There is a hard, movable mass under the tongue on the left side, scarcely painful to touch; not ulcerated. The tongue can be protruded quite well. There is superficial ulceration on the right side of the hard palate extending on to the posterior extremity of the alveolus; the palate is freely movable. There is a single hard gland beneath the angle of the jaw on the right side.

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DISCUSSION.

Dr. HILL did not consider the palate lesion was quite of the nature of ulceration ; it was rather a very granular hyperplasia, in fact almost a lupoid condition of palate. The tongue condition, on the other hand, was highly suggestive of malignant disease. It was desirable to know the after-history of such a case.

The PRESIDENT said he particularly wanted to know what was the nature of the lesion on the hard palate ; he had been treating a similar case for eighteen months with antisyphilitic remedies, arsenic, galvano-puncture, and application of chromic acid. The latter seemed to do much good, but just when success seemed to be attained the ulceration broke out again.

Dr. H. J. DAVIS said epithelioma of the palate often began in this way. One instance was shown at the Section three and a half years ago. Some thought it was herpes and others that it was lupus. He first thought it was lupus, and then tuberculosis, but the patient, a postman, developed later a fungating mass which was malignant. He was shown by him at the Otological Section last October.

The PRESIDENT said Mr. Charters Symonds had drawn attention to the point mentioned by Dr. H. J. Davis, and he (Mr. Tilley) showed, at the Laryngological Society of London, a case which looked like a localized suppurative folliculitis. Mr. Symonds thought this would turn out to be epithelioma, and proved to be correct. The President asked that the case might be reported later.

Dr. KELSON said he was struck by the resemblance of the case to Dr. Lack's, sections of which proved to be papilloma. He suspected the present case was malignant, but possibly it might be papilloma.

Mr. MOLLISON said in reference to the last speaker's remarks that he recently saw a man with a very superficial ulcer on his soft palate, creeping into the right tonsillar fossa. There was a strong tubercular history—almost all his relatives had died from it. The ulcer was superficial and movable ; there were no physical signs of phthisis ; Wassermann's test was negative. He removed the growth locally, thinking it was a localized tuberculous ulcer ; section, however, showed it to be epithelioma. With regard to his case, he replied that he took the ulceration on the palate to be syphilitic, and thought the mass under the tongue was a chronic inflammatory condition becoming epitheliomatous. He would have a picture made of the case and report the result of the operative findings.

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